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The Richard Stawell Oration.[1]

EYE, EAR AND FINGER-TIP.

By PROFESSOR W. A. OSBORNE,
Melbourne.

I SHOULD like, and in no formal manner, to state how much I appreciate the compliment of being chosen to give this oration. In the early part of the year 1897 I arrived in the old university town of Tübingen in Württemberg, South Germany, to start a course of study and research which was to occupy the best part of three years. The director of the institute in which my research was conducted was Professor Gustav von Hüfner, whom I found to be one of the kindest of men. Very shortly after my arrival he asked me to visit him at his residence, which was on the top floor of the institute, and there I saw on the mantelshelf of his study a photograph of a group of some four former research students. One of the faces in the group had a very pronounced individuality, and I asked the Professor who the student was. He replied that it was a certain Herr Staw-well (the "w" sound was correct but exaggerated), then he added: *Aus Australien.* I looked at the features with some interest; but no second sight nor intuition hinted to me that I should one day be brought into close contact with this Herr Stawell in the land of his birth. Shortly after taking up my duties in the Melbourne University in March, 1904, I met Stawell and was quick to recognize his outstanding position as a leader in medical thought. In my opinion, Stawell,

[1] Read at Melbourne on October 5, 1938.

by virtue of his intellectual vigour, his travel, his study abroad and the social advantages of his upbringing, towered above the contemporary physicians of Melbourne with the exception of Henry Maudsley, who had come from my own school, University College, London. Apart from their eminence in medicine, their scholarship and their high ethical standards, there was little in common between these two; for Maudsley was restrained, hesitant, critical, though most gentle in criticism, and even giving the impression sometimes of an impassive *nil admirari* attitude. Stawell, on the other hand, was impulsive and dynamic, passing from enthusiasm to enthusiasm. Sometimes, I fear, I lost favour by suggesting that his enthusiasm was a little uncritical; but I could never accuse Stawell of allowing enthusiasm to displace knowledge, as certain types of temperamental persons do; for whatever subject engaged his passionate interest was studied with scholarly care. Even if in some of his transports over some alleged new idea or discovery he allowed the artist within him to get the better of the critical scientist, one should think how rare and splendid enthusiasm is and how inspiring to others. In the words of an American publicist "enthusiasm is as catching as barber's itch", and that cannot be said of coldly logical thought or exposition.

There was one generous service which Stawell often performed and about which few except the objects of his kindness knew anything, and that was the financing of promising students who were struggling against poverty. I should never have learned about this noble facet of his character had I not discovered it by pure accident. Before the days of the University Loan Fund, Stawell, of course from his private resources, would advance sufficient money to see a bright youth through the medical course. On one occasion when the young graduate considered it a matter of honour to repay this money at the earliest opportunity, Stawell gasped with astonishment. This made me surmise that other recipients of his bounty were not so prompt or eager in discharging their debt.

I have chosen the subject of this oration because I believe it would have appealed to the man whose name it bears. When we first met I was fresh from work in great laboratories divorced from, or never associated with, hospitals, and I placed an emphasis on instruments of precision and quantitative chemical analyses which I admit now to have been excessive. I was inclined to dismiss clinical methods of diagnosis and treatment as lacking in scientific care and accuracy, and many a friendly encounter I had with Stawell, who, I thought, had seceded from the communion of those who had been schooled in laboratory investigation. Further experience of life and further study of our organs of perception have very considerably tempered my advocacy of purely physical and chemical methods of examining the human patient. My science, physiology, has also, I frankly admit, ceased to devote so much time to test-tube, frog and mouse, and has discovered that human physiology should be the proper precursor of human pathology.

Primitive man very early devised means of supplementing fist, finger-nail, toe and tooth, and invented club, knife, axe and dagger. Later came contrivances which enormously multiplied his muscular power; for example, pulley systems and rollers, which allowed him to lift masses of stone hundreds of times greater than what his unaided arms could accomplish. But not even the highly civilized man of Egyptian, Hellenic or Roman culture invented instruments for magnifying human perceptive faculties except the balance for weighing. It is true that crude lenses have been discovered dating from Roman times; but they were probably burning glasses. Eye, ear, nose and finger-tip were reckoned adequate for all that the skilled technician, including the skilled physician, would require. The invention of instruments for augmenting or supplementing our senses is an essentially modern phenomenon, though crude attempts to aid vision may be traced as far back as the thirteenth century, A.D. When scientific investigation demanded quantitative measurement, then the vogue of instruments of precision commenced; for our organs of sense, however acute qualitatively, are crude quantitatively. Moreover, the instrument can give us a permanent documented record to be consulted in the future as often as we wish and not a mere memory liable to loss or distortion. Let me now take the organs of special sense in series.

The Eye.

A simple lens was used by Harvey in his researches on the circulation; but the low magnification made him miss the discovery of the capillaries. Then came the microscope, which has played so great a part in medical science and without which there would be no bacteriology, histology or cellular pathology. The microscope today is nearing those limits of resolution which the physicist has shown us must be present in any magnifying apparatus when the eye is the recipient organ. By using ultra-violet light and the photographic plate we can carry the resolution further; but we are now, thanks to the physicist, rejoicing in the use of X ray analysis, which carries the magnification so far that the position of individual atoms can be demonstrated. I need only refer in this connexion to the striking discoveries regarding the complex, I might well say beautiful, architecture of the protein molecule. Certain tissues of the body opaque to radiant energy perceived by the eye are transparent or semi-transparent to radiant energy of the type we call X rays. We can now watch the heart beating, or the passage of food into and out of the stomach and intestines, or the motile activities of any of the tubular organs without operative interference, thanks to X ray photography and fluoroscopy. Here the eye has been supplemented to a truly enormous extent.

To make quantitative estimations of colour we have the spectroscope, the spectro-photometer and

various forms of colorimeter; to increase our range of colour perception we have the photographic plate with sensitizing dyes which carry photography well into the infra-red and allow us to "see" through fog. One instrument for which a great future may be predicted is the photoelectric cell, which gives a measurable electric current when illuminated. By choosing light filters one may employ any wavelength one likes and obtain quantitative records. Last year it was my privilege to meet Professor Rein in Göttingen, and there I saw to my amazement and delight the manifold uses to which the photoelectric cell could be put in the living animal. It was almost uncanny to make determinations of the amount of red hæmoglobin or pink carboxyhæmoglobin in the circulating blood without damaging a single vessel or causing one drop of hæmorrhage. I foresee the photoelectric cell displacing the eye in all those directions where quantitative analysis or accurate matching is required, and this may soon be an indispensable adjunct to every polarimeter and colorimeter. I should not be surprised if the physician of tomorrow used the photoelectric cell for the determination of his patient's hæmoglobin and for measuring hæmolysis. (One of the earliest, if not the very earliest, to use the photoelectric cell in hæmolytic work was Dr. Johnson, Master of Queen's College, University of Melbourne.)

Admitting all this we must yet credit the eye with remarkable acuity of perception. I have here a pound weight and I let it drop through a vertical height of one foot. As it strikes the table it liberates thirteen and a half millions of ergs of energy. The erg is therefore a small unit. Now a nerve fibre can be stimulated by one-thousandth of an erg, so that a nerve is responsive to a very small impinging energy. But when we examine the human eye we find that a sensation can be evoked by 1/200,000,000,000 erg or about 1/3,000 of the smallest amount of light energy which can be photographed. You may remark that the photographic plate with telescope can detect stars invisible to the eye; but remember that the object lens, which collects the light, may be three feet in diameter as contrasted with the eye's one-third of an inch, and again, thanks to clockwork, the camera follows the star for hours instead of the split second of vision. It is this surprising acuity of the eye which has led to its triumphing over instruments of precision time and time again. Many great foundries or forges tried spectroscopes and other optical appliances to indicate when the metal in the Bessemer process was ripe for conversion, but the firms concerned went back to the eye of the experienced workman. Every rifle is trued by eye and a perfection of straightness in the barrel attained beyond the powers of any instrument. So whilst it is not permitted to prophesy that the use of the eye may one day be supplanted by instrumental methods in medical and scientific procedures, that day is far off. Many important qualities of the human body in health and disease can be observed at a glance which could be registered by our present instruments either not at all or slowly and clumsily. Amongst these I would mention the symmetrical expansion of the thorax, the shades of colour in the skin and mucous surfaces, the different types of tremor, initial stages of incoordination—any physician could extend the list with ease.

The Ear.

The first reinforcement of the faculty of hearing was by the stethoscope, invented by Laennec in 1816. That instrument, to which many historians of medicine will give first place in importance, allowed the physician to gain information about heart and lungs which was previously unobtainable. The stethoscope merely conducts; it does not really magnify. Augmentation of stethoscopic sounds has been recently adopted; but the qualitative discrimination of the ear remains the chief avenue of diagnosis. Microphone amplification and registration of the sounds of the heart have been pursued in many laboratories, including my own; but the results so far achieved are not to be compared in diagnostic value with what the ear detects normally. A good barometer will register a difference of reading when carried from floor to table; the ear is responsive to a pressure change equivalent to an ascent or descent of 1/30,000 of an inch. Could we nod our heads quickly enough we should perceive a note. It will, I imagine, be a long time before the trained ear of the physician listening to heart or lung will be supplanted by any sound-recording apparatus. There are delicacies of change in the sounds caught in the common stethoscope for which we have not yet a scientific explanation, but concerning the diagnostic value of which there is no doubt. I would remind you that in the minting of gold coins, after the most careful weighing and measuring, the coin, as a last test, is bounced on an anvil and listened to by a human ear. The ability to detect differences of pitch arouses our admiration in the violinist and piano-tuner. It has been said that a fiftieth of a semitone is appreciated by a trained ear.

May I take this opportunity of suggesting that sound amplification in the manner now so familiar may be used for parts of the body other than heart and lungs. Muscles emit a note on contracting, and theory would indicate that certain abnormalities of the nervous system and of the muscles themselves might be investigated in this manner. The body produces far more sounds than we are aware of; but these sounds are lost in the general noise of our surroundings. A distinguished physiologist built a subterranean room so devised that the human body was insulated from every force except gravity. When the experimentee was locked up and the last bulkhead closed he soon telephoned to be released, as the noise of his organs oppressed him. The heart thundered, the arteries purred, the joints wheezed and creaked, muscles boomed, whilst the gurglings of the alimentary canal were obscenely terrific.

Finger-Tip.

In the finger-tips we have a finely developed sense of discriminative touch second only to that of tongue and lip. In a novel that once had a great vogue, a blind man enters by mistake a house in which a murder is being committed. He is seized and feels a ring being pressed to his forehead. Now to give the impression of a ring on the forehead the firearm employed must have had to possess the dimensions of a blunderbuss. The ordinary pistol or revolver would be felt as a blunt point only.

The mechanisms of discriminative touch have been recently shown to be more complex than was imagined. First of all we have a mosaic of hair-trigger receptors, each of which sets going a fusillade of nerve impulses when distorted. The greater the impinging energy, the more rapid is the machine-gun fire. One serious complication is that one nerve fibre may subserve two or more receptors, which may therefore be called upon to send along one and the same fibre discharges of impulses at different rates. The result will be interference, and possibly something like beats in sound may arise. The finger-tip pressed on a portion of resistant matter has a large number of receptors, constituting a definite pattern in the mosaic, simultaneously discharging along nerves less in number than the receptors. This jangle the brain analyses and the analysis is almost as remarkable as the analysis of the messages sent into the ear. Then even if there is no change in the relation of finger to object the rates change, becoming less frequent. If the finger or the object touched is moved then a sequence of excited receptors is produced, each giving a jangle of impulses to be analysed.

The information gained by the finger-tip could not possibly be registered by any instrument. The skilled physician, with his finger on his patient's radial artery, learns far more than rate and regularity or irregularity; the old terms full, large, hard, small, soft, running, bounding, languid, thready, wiry, mouse-tail, water-hammer, gaseous *et cetera*, imply conditions which have importance in diagnosis, but which the best pulse recording instrument or sphygmograph cannot reveal. Sir Leonard Hill has always declared his belief that the veins accompanying the radial artery add their evidence in influencing the final verdict. Just as the blind man can educate his finger-tip and his cerebrum to read Braille, so the physician can educate his finger-tip and cerebrum to read the pulse, to gauge the internal pressure of the eyeball, to assess the amount of subcutaneous tissue fluid, to detect diminution of tone in muscle (unknown in physiology but very real at the bedside), to search for pulsation in a tumour or a fracture in a bone. I remember once being much impressed by a dealer in pigs, who picked out, rapidly and accurately, by merely pressing his fingers on the animals' backs, those which had been fruit-fed as contrasted with those fed on potato.

Olfactory Sense.

Though smell has not been included in my title, by reason of its limited use in diagnostic technique, yet a word or two may be given. In the human being, as is well known, the olfactory sense is degenerate compared with the lower animal. One reason for this is that the erect posture in man has elevated the nose above the ground; but the chief causative factor is rather to be found in the fact that the skilled hand needs guidance by vision and cannot be directed by smell. Degenerate though it may be, our sense of smell puts to shame the most delicate qualitative analysis of the chemist and ranks higher than the spectroscopic findings of the physicist. I hold in my hand a piece of chalk weighing one gramme, or roughly one-twenty-eighth of an ounce. The thousandth part of this would be a milligramme or one-twenty-eight-thousandth of an ounce. Now the human nose can detect 1/460,000,000 milligramme of some odorous bodies. This is why the tea-taster or judge of wine must depend on his unaided senses; for no instrument or chemical procedure can be of the slightest service. When we think of the olfactory powers of a dog we are driven to the belief that this animal's nose must be responsive to individual molecules.

The sense of smell, I have stated, has been put to little use as a clinical method. I suggest with diffidence that it could be cultivated more than it is. Skin secretions and pathological states of the skin, for example, favus, the breath, and the excretions, often tell a tale through the emitted odour.

Electric Sense.

We have in our bodies receptors attuned to sound, light, special chemical groups, warming, cooling, skin contact with the external world, weight, pressure, wetness and dryness; but by a curious omission in evolution we have no organ of electric perception. I say curious because differences in electric potential are widely distributed throughout nature, and every living tissue in our body develops electric energy as it performs its proper function. The late Mr. John Sutherland, of Melbourne, in his book, "The Bonds of Society", playfully referred to what might happen if man had an electroscopic organ:

> Our electroscopically-gifted man has by his one single added sense greatly advanced the extent to which he is aware of the contents of the universe, aware both of what he understands and of what he fails to understand in the things he perceives, aware also to an increased degree of what he does not know but suspects in the unknown.
>
> An electroscopic sense, new gateway of wisdom, would become, like all other senses, and in contrast therein to the electroscopic instrument of science, an avenue of fresh emotion. The lightning charge, immured within the overhanging cloud, would not only loose the fountains of inherited ancestral feeling but would be observed electrically reflected in every post and tree, adjacent fence and stone and flower, even as the sunset is seen within the watery pools. The enamoured youth would dilate in poetry to his sweetheart upon the delicate distributions of surface density throughout the landscape, and, should an electric charge mantling upon her nose symbolise susceptibility to masculine admiration and of feminine reluctance to confess it, his soul would overflow with

ardour to perceive the tender glow superadded to the soft warmth of her electric blush by the inductive reflection of the charge within the cloud.

Science has here stepped in to supply what Nature has omitted. In the electrocardiograph the currents of electricity produced by the heart in its beating are tapped and measured and the information gained in this way has been of yeoman service in the diagnosis of cardiac conditions. Every time a nerve message races along a nerve fibre it is accompanied by a change of electric potential, which our modern instruments measure with ease. By means of current amplification we can often trace the course of an entrant impulse through the central exchange called the spinal cord, and today many investigators are busy registering the many hundred impulses which are careering through man's brain, and they are now able, by mapping centres of nerve storm or islands of unnatural nerve calm, to fix the site of an irritant focus or a region of degeneration.

The Integration of Sense Impressions.

No matter how very sensitive a receptor may be or how many receptors a mosaic may contain, there is necessary for perception a brain, receiving, sorting, classifying, comparing, contrasting and integrating them. It came as a great surprise to physiologists to find that the nerve of hearing in a cat sends up a Beethoven symphony to the brain as well as the auditory nerve of a human. But the cat's brain can make nothing of the grand harmonies and tone sequences, the daring discords and their resolution. The sensory mechanism is there but the brain is inadequate. How profoundly experience can supplement the acuity of a sense was once brought in a lively way to my notice. On a voyage to Australia from China the officer on the bridge reported that an object looking like an open boat was on the starboard bow. Captain and officers examined the supposed boat through telescope and field-glasses, but were divergent in opinion whether the boat was upturned or properly floating and whether or not it contained anything living. An elderly pilot, William Beale, well known in these waters, was standing beside me on a deck much below the bridge. Giving the distant object one steady gaze with eyes unaided by any instrument he remarked laconically: "Sick turtle". The ship's course being altered, she came alongside the floating unknown, and a sick turtle it was.

One pronounced faculty the brain possesses is that of sorting and summating diverse sense impressions even when these individually do not enter consciousness. Why is a dead animal so readily recognized as dead? Of course, breathing may be a major movement, but there are others, such as the arteries beating in the skin and limbs, the tremor of the limbs, eyeball and pupil, the delicate changes of colour in parts well supplied with blood. The cinematograph early showed that the less make-up a face has the more living it appears on the screen, as the complexion alters with each pulse and varies even with the breathing. These alterations may not be analysed in consciousness, but they are summated in the brain. Edgar Poe, whose powers of philosophical analysis have never been given justice, pointed out forcibly that the man of science or the detective does not reason by the syllogistic processes of formal logic. Intuition he defined as the conviction resulting from deductions or inductions, of which the processes are so shadowy as to escape consciousness, elude reason or bid defiance to capacity of expression. It is in this power of the brain to gather together evidence from widely divergent receptors and make these to converge and mutually reinforce each other so that what is below the threshold of consciousness becomes part of perception, that we find a faculty that no scientific instrument can ever imitate. We may at a glance know that a man is in fever or that he is a neurotic and yet be unable to explain our belief when cross-examined by a barrister. The individual elements of our cognition may never enter consciousness unless marked attention is directed towards them. A modern clinic may subject a human patient to a series of separate investigations by a team of experts and their reports may be summed up by a professional diagnostician; but that summing up is a clumsy affair contrasted with what we are doing every wakeful moment. Having the prisoner and the witnesses before them means a lot to a jury; were its members supplied only with the written records of the examinations and in the prisoner's absence, their disagreements would be more frequent and their verdicts more capricious.

That instrumental investigation of the body will improve and expand we may be reasonably sure. Methods of which we have now no inkling will be applied; for example, a few years ago no one dreamed that radioactive isotopes would give the valuable information we gain today from noting their sojourn in various tissues, their transport and their elimination. I have mentioned the photo-electric cell and its modern uses in physiology. The rapidity of progress of organic chemistry in detecting the nature of hormones and manufacturing them on a large scale is bewildering. It would appear that soon every phase of growth and development, every characteristic of age or sex, will be under control. We may yet apply to humanity some of the tricks of ant, bee and termite. The chemistry of the toxins produced by disease germs is as yet an untouched field of research. One may here pay a tribute to the investigations being conducted on snake venom by Dr. Charles Kellaway and his team of scientists at the Walter and Eliza Hall Institute.

But when the widest allowance of speculation is indulged in for the evolution of applied physics and chemistry, there will remain as essential mechanisms of diagnosis, eye, ear and finger-tip, not only on account of their singular acuity, but also by reason of the magnificent integrating power of the brain, using devices which have taken millions of years to develop and compared with

which our card-indexing systems are ludicrous. Let the student by all means learn the very latest instrumentation; but it would be a retrograde action if he omitted to train and employ the natural organs of perception, the seeing eye, the alert ear and the *tactus eruditus* or skilled touch of the finger.

ALCOHOLISM AND ITS TREATMENT.

By JOHN BOSTOCK, M.B., B.S. (London), D.P.M., F.R.A.C.P.,
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IT is a psychiatric truism that frequently the more apparently simple the case, the greater the difficulty in treatment. The problem of the alcoholic comes into this category owing to the fact that the patient must be taught so to amend his life as to become a total abstainer. As the roots of alcoholism are usually deep, the goal is not easy.

From the psychiatric point of view cases of alcoholism may be divided into two categories: (*a*) those in which there are severe complications, such as neuritis, mental confusion, hallucinosis or delusions; (*b*) those in which periodic drinking leads to social difficulties. The prognosis in all cases depends ultimately upon the amount of organic changes (dementia) and the cooperative ability of the patient. From the very outset of treatment this latter factor must receive great attention. As an example may be cited the age-old controversy as to whether cessation of alcohol should be abrupt or tapered. Judging from the fact that in 1937, English prison statistics showed that only 246 of 63,000 inebriates (less than 0·5%) developed *delirium tremens*, the danger of a swift withdrawal would seem definitely remote. None the less, it is usually wiser to withdraw the alcohol gradually. This is a psychological measure leading to a better transference between patient and medical attendant. The latter appears more likeable and understanding. He appreciates the difficulty of withdrawal and is not the stern mentor of the schoolmaster pattern. From the same angle, it is usually wise to allow the patient a say in his times for taking alcohol and in the kind of alcohol he prefers.

The Treatment of Alcoholism with Severe Complications.

Delirium Tremens.

The variability of the onset of symptoms in *delirium tremens* is most pronounced. There may be a fulminating delirium or a protracted type of mild confusion. In all types there is a very real danger of collapse, and the prognosis must be guarded.

Piker and Cohn have given an excellent account of its comprehensive management, and report only 5·3% of deaths in a series of 300 cases. They advise *inter alia* rapid withdrawal of alcohol, purgation by cascara and magnesium sulphate, spinal fluid drainage as early as possible, the intravenous administration of glucose, hypodermic injections of caffeine, the use of digitalis and of sedatives, such as 11·2 to 15 cubic centimetres (three to four drachms) of paraldehyde or the intravenous injection of "Sodium Amytal", and a high caloric diet rich in vitamins. If the patient is asleep he must not be wakened. Undoubtedly attention to both nursing and medical details is imperative in dealing with a condition such as *delirium tremens*, which is of the nature of a medical emergency.

The Meta-Alcoholic Psychoses: Korsakoff's Psychosis.

The classical picture in Korsakoff's psychosis is a special type of amnesia associated with polyneuritis. The patient forgets incidents and composedly fabricates new and often grotesque happenings to fill the void. The neuritis may be severe or slight. Deep palpation of muscles and pressure over nerve trunks should always be performed in suspected cases. Since alcoholism means a lowered food intake, and a similar type of neuritis occurs in deficiency diseases, it has been suggested that avitaminosis is the primary cause of alcoholic neuritis. Clincial results have confirmed this hypothesis. The exhibition of vitamin *B* in large quantities is of great help in treatment. In my experience it is assisted by injections of insulin, about ten units being given three times a day. This increases the appetite and diminishes the pain. Tendency to foot-drop or wrist-drop must be corrected on the usual lines.

Alcoholic Hallucinosis, Paranoia and Pseudoparanoia.

The usual type of reaction in alcoholic hallucinosis is one of persecution. Where hallucinosis is present the patient is tormented by "voices", which give messages of a sexual and disgusting nature. Usually in married men, the wife is the focus of attack. As chronic alcoholic excess leads to impotence, an organ inferiority develops. By a process of projection, the wife is blamed and her indifference is allegedly due to her infidelity. Such cases must be dealt with along general psychiatric lines. In many the disorder becomes chronic. Not infrequently the result is surprisingly good. The most important items are the return of insight, the acquirement of transference and the building up of new environmental and personality factors, which will counteract the return to alcohol as a desirable flight from reality.

The Treatment of the Ordinary Alcoholic.

The first step in the treatment of the alcoholic is to evaluate the reasons for taking alcohol. It is not enough to state that alcohol produces a temporary cessation from conflict and a feeling of euphoria. Many people need both, but are abstainers. There is usually an inherent defect in the personality make-up, which produces a tendency to flee from rather than to face up to the hard facts of life. The familial type of alcoholic must be regarded as a familial "spinelessness" in general, rather than as a specific alcohol-loving tendency.

Such people have frequently strong feelings of inferiority, for which alcohol becomes a panacea. The part which habit and conviviality play in the creation of the confirmed alcoholic is large. It accounts partly for the downfall of rich men's sons and for occupational alcoholics, such as are met with in the liquor trade.

Finally, alcoholism not infrequently is the symptom of an underlying psychosis, solving the problem of a schizophrenic or manic-depressive person. When we are asked to treat an alcoholic our aim must be to evaluate the causes, to search for an underlying stratum of normality, to strengthen it and protect it as carefully as the gardener guards his seedlings from the encroaching weeds. Both gardening and the care of alcoholics need unlimited patience.

The ideal method would include complete isolation from alcohol for at least six months under pleasant surroundings. It would include daily psychological talks by the physician, planned occupational therapy and graduated physical exercise. For the vast majority the excessive cost proves an insuperable barrier; as so frequently happens, economics is king. Fortunately, excellent results are often achieved by other means. Many techniques have evolved. Their sheet-anchor is suggestion and persuasion. Suggestion may be by deep or light hypnosis, or may occur in the course of ordinary conversations. The choice will depend largely on the individual preference of the physician. There is a consensus of opinion (i) that the patient must undertake to carry out treatment for a period of a year, and (ii) that treatment for the initial weeks must be given every day or even twice a day.

The chief difficulties in describing the method of treatment are the intangibility of psychological processes and their wide variation. It may be useful to discuss it under some practical headings.

Transference.

It is essential that the patient have faith in his physician. The physician must take such a personal and kindly interest that the patient feels that any lapse would be letting him down. The physician must take a line of action with regard to friends and relatives. He must fight the patient's battles, so to speak, clear the ring and see that there is fair play. He must engender a note of optimism, not merely in the patient, but (equally important) in the wife or husband, and it is essential that this be not mere lip service. The transference is helped by a complete physical examination.

Type of Suggestions.

The patient is given positive suggestions—that his personality is improving, that he is mastering himself, that he is more worth while in every way. He is asked to repeat such formative thoughts by auto-suggestion. In my experience one of the strongest psychological levers is the constant repetition of certain associated ideas. The patient is asked to state what is the worst feature of alcoholism. It may be shame of meeting his fellows or his wife or the realization that he is a failure *et cetera*. Whatever it is he should keep that feeling fresh in his memory by associating it with the thought of alcohol fifty times a day. He is asked to make it such a vivid memory as to leap into consciousness on passing a public house, on smelling an alcoholic breath or even on seeing the printed word "alcohol". It is explained to the patient that the chief cause of a relapse is forgetting the bad effects of alcohol. The tendency is to remember the good and obliterate the bad. Our object is to reverse the process. He is taught not to apologize for his teetotalism but to glory in it. He must feel sorry for his friends who are still chained to the fetters of alcoholism.

Drugs.

Insomnia is a frequent symptom of abstinence. Phenobarbital, 0·1 gramme (two grains), or soluble barbitone, 0·3 to 0·6 gramme (five to ten grains), is usually sufficient to tide the patient over this stage. A bromide mixture containing 0·6 cubic centimetre (ten minims) of tincture of capsicum, taken three times a day, serves as a sedative and has a suggestive value. A weekly hypodermic injection is justifiable. Gold salts have been recommended, but "Oscol Manganese" is more easily procurable and serves a like purpose. The treatment ensures that the patient still considers himself under treatment, and at each visit the suggestions as to personality and alcoholism are repeated.

Environment.

As mentioned in a preceding paragraph, the physician must take a strong interest in the whole environment of the patient. Relatives and friends must be interviewed. Work must be adjusted so as to produce lessened strains. Amusements are supervised. Friendships are severed if inimical to the new outlook. Life begins again on the new abstinence platform. No detail is too small to ignore if it helps towards the objective, which is a permanent teetotalism.

Periodic Physical Overhauls.

It is significant that civilized man is largely ruled by fear, and medicine has presented him with new ogres. The sphygmomanometer, stethoscope and pleximeter can create emotional states comparable to the stones and knuckle bones of the primitive medicine man. In the care of the alcoholic it is justifiable to exploit the fear complex. Explain that alcohol is a circulatory poison, which kills every tissue in its path. Already there are signs of degeneration in the heart, the liver and the blood pressure. It is essential to know if there has been any recovery. At each examination it is stressed that the bank of life is not inexhaustible and the next bout may tip the scales towards insolvency.

Do Not Preach.

It must be remembered that the physician is the last of a long series of moral advisers. Cajoling, preaching and forcing have been tried repeatedly, and without success. Our only hope is an entirely new aproach—that of science, psychology and medicine. One must be careful not to cloud the issue by identifying it with the previous failures.

Prepare for the Relapse.

There is a probability that a relapse will occur. If it does the physician wishes to be informed straight away. The patient must be told that if he does so his prompt return to the consulting room will be regarded as a sign of strength and not of weakness. It will be a compliment to his best friend—the man who has most faith in him—his doctor.

Conclusion.

It is hoped that these simple rules will not create a false atmosphere of simplicity. As with all psychological treatment, the way is not easy, and a single error in management may spoil the results of months of hard work. Even with a seemingly perfect technique failure will sometimes be encountered. The knowledge that there are some glorious successes will keep alight the lamp of optimism, without which the treatment of alcoholism is but a dark and dreary stretch.

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NOTES ON "CARDIAZOL" THERAPY IN SCHIZOPHRENIA.

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IN view of the recent publication by R. S. Ellery and D. C. Lear of the results of "Cardiazol" convulsion therapy in certain cases of schizophrenia, we think that a brief account of our own work along these lines may be of interest.

The first patient was treated at Lachlan Park Hospital on March 7, 1938. Since then we have instituted the treatment in all available recent cases of schizophrenia. The majority of the patients have had their entire course of treatment at Lachlan Park; two were transferred to Millbrook Rise Psychopathic Home when their remissions became very pronounced, and completed their treatment there; and three have had their treatment entirely at Millbrook Rise.

The accompanying table shows the details of treatment and the present condition of our first fifteen patients.

No untoward results have occurred from the treatment. In one case, not included in the series, the terror before each injection was so great that the patient was uncontrollable; after approximately four injections it was decided to abandon the "Cardiazol" therapy in favour of hypoglycæmic shock therapy. One other patient was extremely terrified of the fits, but was not unmanageable, and quickly recovered from her panic. In no other case has anything more than a pronounced degree of apprehensiveness been noted. All the patients dislike the treatment, and when they regain a normal mental condition are very averse to any discussion of their feelings during the preconvulsive state. One, whom we did persuade to talk the matter over, gave us an interesting suggestion as to a minor point of treatment. He said that though the sudden "wave of blackness" which heralded the onset of the fit was terrifying, the recovery period was infinitely worse, as he awoke completely disorientated and with no idea of his own identity. If, when he fully regained consciousness, there was someone actually at his bedside, he was greatly helped in readjusting himself.

Our technique of treatment is much the same as that described by Ellery and Lear, with one exception. We found that the method of delivery of the full dose into the vein before the release of the tourniquet was not so successful in our hands as the delivery of the dose through a serum needle after the release of the tourniquet. We have so far been fortunate enough to encounter no patient with veins so small as to prevent the use of this needle. We have also found that our average dose tends to be slightly higher than that used by these authors. Our practice has been to start with a dose of 5·0 cubic centimetres of "Cardiazol" and to increase it by 0·5 cubic centimetre per injection. In the majority of our cases we have advanced to 10·0 cubic centimetres. In no case has our initial fit-producing dose been less than 5·0 cubic centimetres.

It appears to us that the greater the initial dose required to produce a fit, the less the likelihood of a satisfactory remission. The converse does not appear to hold true, however, and we do not think that the production of a fit by a small initial dose has any hopeful significance.

We are at present modifying our technique in two directions suggested by von Meduna in his latest publication. The first of these is concerned with the time interval between convulsive attacks. At first an attack was induced every day; but we very soon altered this to three times a week. In view, however, of von Meduna's recommendation of a still longer interval, we are now inducing attacks only twice a week. This change has been so recently made that we have not as yet been able to determine any alteration in effect on the patients.

TABLE I.

Patient.	Age. Years.	Sex.	Type of Schizophrenia.	Duration of Illness.	Dosage of Cardiazol.	Number of Injections.	Number of Fits.	Time Required for Induction. Minutes.	Condition after Convulsions.	Course.	Result.
					Cubic Centimetres.						
C.S.	21	M.	Katatonic.	10 months.	5 increased to 10	23	21	11	Drowsy.	Steady improvement.	Complete remission.
W.S.	21	M.	Hebephrenic.	2½ years.	5 increased to 10	34	31	13	Confused.	Spasmodic improvement.	Remission and relapse; insulin treatment substituted.
M.C.	26	M.	Hebephrenic.	2 months.	5 increased to 8·5	10	9	15	Quiet.	Steady improvement.	Complete remission.
B.F.	26	F.	Katatonic.	2 months.	5 increased to 9	27	26	12	Quiet and confused.	Spasmodic improvement.	Complete remission.
J.O.	21	M.	Hebephrenic.	About 6 months.	5 increased to 10	7	6	10	Excited.	Some improvement.	Still under treatment.
V.M.	21	M.	Katatonic.	6 months.	5 increased to 10	8	8	10	Quiet.	Some improvement.	Still under treatment.
B.M.	36	M.	Katatonic.	4 years.	5 increased to 10	26	21	13	Confused.	Some improvement.	Partial remission.
C.K.	25	M.	Hebephrenic.	5 years.	5 increased to 10	9	8	7	Quiet.	——	Still under treatment.
L.C.	38	M.	Katatonic.	9 years.	5 increased to 10	13	11	11	Quiet.	No improvement.	——
G.B.	33	M.	Katatonic.	14 years.	5 increased to 10	18	17	10	Confused.	Remission and relapse.	Still under treatment.
I.H.	25	F.	Katatonic.	2½ years.	5 increased to 9	18	16	10	Excited.	Steady improvement.	Still under treatment.
P.W.	33	F.	Paranoidal.	2½ years.	5 increased to 10	12	10	10	Noisy.	Some improvement.	Still under treatment.
F.G.	21	M.	Hebephrenic.	6 months.	5 increased to 7	7	7	12	Slightly confused.	Rapid improvement.	Complete remission.
G.B.	28	M.	Hebephrenic.	12 months.	5 increased to 7	10	10	17	Very restless.	Steady improvement.	Still under treatment.
B.C.	20	F.	Hebephrenic.	18 months.	5 increased to 7	7	7	12	Quiet and drowsy.	Steady improvement.	Still under treatment.

The other modification consists in the immediate repetition of the injection if the fit fails to occur. Our practice now is to have a second syringe at hand, charged with a dose of "Cardiazol" equal to the one administered. The needle is maintained *in situ* until the first twitch of the convulsion. Should this not occur within two minutes, the second syringe is attached to the needle and a further dose, usually of 5·0 cubic centimetres, is given. This procedure is rarely necessary; but we have used it two or three times since the above figures were compiled, and have gained the impression that the second dose does not require to be so great as the first.

We think that one of our cases is worthy of special comment.

G.B., aged thirty-three years, a male, had been a patient at this hospital over a period of fourteen years. We had no intention of attempting this therapy on him; but one day, finding him in a katatonic stupor with pronounced *flexibilitas cerea*, we decided that we would induce "Cardiazol" convulsions, merely to see if any effect at all would be produced. The result, though short, was dramatic. After his first injection he was definitely improved, and after five or six injections was able to conduct an intelligent conversation, to play cards and to enjoy an outing with his parents. Unfortunately this state was maintained for only about a fortnight and he has since then relapsed. The attendants, who have known him since his first admission, are convinced that he is, even now, better than he has been for the past two or three years.

While making due allowances for the fact that sudden remissions occur spontaneously in schizophrenia, we think that this one was so closely connected in onset and progress with the injections as to leave little room for doubt that it was produced by the "Cardiazol". We intend to persevere with the treatment of this patient, by way of interest, though we have little hope or expectation of producing any permanent result.

Although it is as yet too soon to speak with any certainty of the results produced, we think that in "Cardiazol" therapy we have at least a valuable weapon in the treatment of schizophrenia. We fully agree with Ellery and Lear that it is not a method of treatment to be undertaken indiscriminately or by any but those adequately equipped for the treatment of mental disease. Also, in spite of, or even because of, the academic interest of our one case of fourteen years' standing, we are convinced that no results can be looked for in any but early cases. With all the limitations that must be placed on the enthusiasm encouraged by early success, we believe that "Cardiazol" therapy holds out a definite hope for the improvement, if not the cure, of certain early schizophrenics; and any form of treatment that does this is unquestionably of great value.

THE STIFF JOINT.[1]

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THE word "joint" implies a junction between two bones. It would have been better to have a word denoting a place at which movement between two bones takes place, because it is the movement of bone upon bone which counts more than the joining of bone to bone. The *raison d'être* of both bones and joints is to make muscle movement more effective. This is not a platitude; it is an all too

[1] Read at a meeting of the Orthopædic Section of the New South Wales Branch of the British Medical Association on August 25, 1938.

frequently neglected point of view. As MacKenzie says, bones and joints are "the servants of their muscles". It is movement, the function of muscles, which counts. In orthopædic work, muscles come first. By and large, we measure life by our capacity to move: "likely" means able to move well, and lack of good movement implies, to some degree, partial deadness. Hence, to remedy stiffness in joints, either by prevention or cure, is no mean service. One can state here and now one's belief that, if we all had the time to heed and to absorb and to learn and relearn the lessons taught by Robert Jones in the treatment of joints, stiffness of joints, loss of function and associated pain would all be lessened in our midst. It is my belief, too, that Robert Jones made a hearty contribution to the march of science when he blended the fundamental truths at which H. O. Thomas arrived about joints and their behaviour, and which aid us so much in diagnosis and treatment of arthritis, with the craft of manipulation of joints, which, granted a sound diagnosis, aids us so much in the practical management of one type of stiff joint trouble. It was Robert Jones's role to reconcile motion and rest in joint treatment, and this in spite of the position taken up by his master Hugh Owen Thomas, that rest was the only thing.

Robert Jones' last paper before his death was entitled "Problem of the Stiff Joint". It was reprinted in *The British Medical Journal* of December 5, 1931, where it stands full of the wisdom of experience, full of practical points for us all, and worthy of being read again and again, and kept as a *vade mecum* of joint management.

It was Thomas's credo that every unsound joint had to be rested, that when it had had sufficient rest it had to pass the test of recovery, and, this done successfully, there was nothing but active motion (ordinary use) required to restore it. It was Jones's contribution that passive movement (manipulation) could, with advantage, be interposed between Thomas's test of recovery and his active motion.

As you all know, any discussion on a stiff joint is liable to split the camp into two contending parties: the resters and the movers, each ardent. The Greek's "gold mean", the Chinese philosophy of "fifty-fifty", and Jones's efforts on behalf of the middle way are all in harmony.

It seems likely, when one considers, that the more tuberculous joints one saw the more one would become convinced of the need of rest for joints, and the fewer tuberculous joints one saw the more one would lean towards motion. That Thomas was set in the midst of tuberculous joints, that he saw every week the ill-effects of manipulation of such joints, that he had not the aid of X rays, have been to the gain of medicine, in that these things helped him to the discovery of first principles. It would seem that tuberculous disease of a joint, with its insidious onset, with its protective muscle spasms, with its joint effusions, its protracted course, its cold abscesses pointing here and there, its sinuses and its secondary infections, and its numerous other complications, its tendency to produce deformity, and its definite ending in ankylosis in most cases, gave opportunity to Thomas for the gradual acquisition of a mass of joint lore, which well serves as a "back log" in our general knowledge of orthopædic surgery. Just so did the study of typhoid and its complications serve to initiate the student of my day into the physician's arts and crafts.

It was in this scene, surrounded as it were by tuberculous joints, that Thomas built up, by his genius, the incomparable knowledge which was to enable him to discern basic, strong and stable truths for our general guidance. To reread his definitions is always a joy and a profit, and one offers them again and again, and without any apology, to an audience which must have had them often before.

THOMAS'S DEFINITIONS.

The Healthy Joint.

A healthy joint is one whose radius of action is equal to the radius of a similar joint in the majority of people, though not equal to the radius of some exceptional examples. Again, it is one which has never been the subject of inflammation, and is fitted for the daily weight and friction attendant upon use, provided that it has the usual interval of repose, this interval being necessary, otherwise inflammation would arise from overuse. (We know this mishap to be a not uncommon interruption of attempts at task pedestrianism.)

The Inflamed Joint.

An inflamed joint is an articulation the radius of whose action, in the absence of the practice of more or less immobility, is gradually diminishing. This diminished radius of action, which is usually and correctly designated joint deformity, tends to increase as long as the joint is unsound, and is caused solely by the efforts of nature to practise immobility as a means towards resolution. An inflamed joint may or may not be accompanied by effusion within the capsule, according to the circumstances influencing the joint lesion.

An Ankylosed and Unsound Joint.

An ankylosed, but inflamed or unsound, joint is an articulation in which some signs of inflammation remain, and in which no motion can be detected. This evident absence of motion at the articulation may arise from want of pliability of the capsule and its surroundings, or there may be osseous adhesions between the bones comprising the joint; but in an unsound ankylosis, progressive and evident motion will follow use if the limb in which the ankylosis exists is employed for its usual purpose. For instance, if at the commencement of use it be in a practical position, use will cause it to recede from this, or should it be in an impractical or defective position, this defect will be increased, no matter what may be the nature of the ankylosis. This fact justifies one in classing all forms of unsound ankylosis as "false ankylosis".

An Ankylosed but Sound Joint.

An ankylosed but sound articulation is one in which the nature of the ankylosis is immaterial, as no trace of inflammation remains. Whether the ankylosis be accompanied by practically avoidable defect or not, ordinary daily use cannot bring on any variation of position—an indication that such condition of ankylosis should be termed "true ankylosis".

A Sound Joint.

A sound joint is one from which all traces of previous inflammation have passed away. In evidence of this sound condition and complete recovery, there may be noticed that by ordinary daily use the radius of action, to and from the position maintained during treatment, is seen to be gradually increasing, no matter in what position the limb may have been fixed during treatment—an infallible sign of soundness and a justification for no further restraint or surgical interference.

The Test of Recovery.

To round these definitions off, one must quote Thomas again on the test of recovery:

> Should the articulation be so far recovered that it *appears* sound to the surgeon, and if the patient confirms this by his *expressed feelings*, the articulation should be put to the test of Use, i.e., the Test of Recovery. As a general rule, one month of uncontrolled use of the limb will give the required information. This test soon shows us whether the articulation is genuinely sound, or has only appeared so. If a joint has a range of movement of 40°, and this range is diminished by 20° or 30° when use has been allowed, we can be sure that the disease is still active. Or supposing a joint is fixed at a certain angle by fibrous ankylosis, and, when used, it becomes fixed at another angle, we know that recovery has not taken place.

The Doctrine of Rest.

Again, Thomas writes concerning treatment: "Accumulated experience . . . shows a marked tendency in favour of securing, as far as practicable, the *immobility of unhealthy* joints or when the *soundness* of the joint has been secured, *non-interference*." "Interference" he defines elsewhere as passive motion, counter-irritation, shampooing [*sic*] or electricity.

This is the doctrine of rest raised to the highest pitch. It is the doctrine for arthritis. He counted on active movement only to get rid of remaining adhesions.

On the other hand, Robert Jones comes, at the end of his long and marvellously full life, saturated by orthopædic experience, to this conclusion:

> A joint stiffened by arthritis should be kept at rest until pain and inflammation have subsided. A joint stiffened by simple adhesions, whether intra- or extra-articular, should be moved actively or passively, or even forcibly, if necessary.

This is not, in essence, a difference of opinion. Robert Jones accepts every principle in the pypramid Thomas built, but interposes an extra one near the top of the pyramid.

Behaviour of Joints.

A joint (i) is vulnerable to violence, either as one major injury—stub blows, wrenches, over-stretchings—or as the repeated minor violences imposed by overuse or misuse in malposition (as in the knees in knock-knee); and, owing to its relatively poor and stagnant blood supply (ii) it is liable to become the dumping ground of circulating toxins of alimentary origin, and of wandering cocci (staphylococci and streptococci) of dental and tonsillar origin or of gonococci or of the direr organisms of tuberculosis or syphilis.

Whatever hurt, or whichever constitutional stress, is put upon it, the joint can voice its distress in two ways only. The synovial membrane becomes congested and swollen, and then discharges an effusion into the joint; and later—a long time after—the articular cartilage and the ligaments surrounding the joint degenerate, the articular cartilage fibrillates, and the ligaments become fibrosed. The timing of a joint reaction is very slow. Nature takes as many months to heal a joint as she takes weeks to heal an injury to a part well supplied with blood vessels, similarly hurt.

The synovial membrane congestion stage, slight or severe, enduring for a while only, as in minor traumata, or for years, as in tuberculosis, is the "inflamed joint" of Thomas. Swelling of the joint tissues, effusion into the joint, and heat there may, or may not so evidently, be.

The best guide to the presence of arthritis (the inflamed joint) is the reaction of the muscles of the joint.

Behaviour of Muscles.

Joints in fault have faulty muscles to attend them. The muscles and their joint have a closely correlated nerve supply, and any affection of the joint affects reflexly its muscles.

Atrophy of the muscles of a joint appears one day after an injury to the joint. It is therefore reflex in origin and not due to disuse. It is an infallible clinical guide to the presence of joint inflammation, and, conversely, when the atrophy disappears, to its recovery from the inflammation. This weakness may persist after the joint is better (quadriceps).

As well as atrophying, the muscles of a joint go into reflex spasm. When motion of the joint, passive or active, is attempted, the muscles, all of them, go on guard in an attempt to stop the motion, and can be felt to tighten under the examiner's hand.

The third muscle reaction is muscle shortening. When all the muscles are in spasm round a joint, the muscles that act at the greatest mechanical advantage (for example, the pectorals in the shoulder, the adductors of the hip, the flexors of the knee, the peronei in the foot) become the dominant ones, pulling the part over to their side and gradually becoming shortened. They are the prime producers of deformity. This adaptive shortening may prevail after a joint is better and,

like the muscle atrophy, may indefinitely delay complete recovery of a joint and prolong its stiffness, unless detected and dealt with.

The Role of Physiotherapy.

It is here that the well-informed physiotherapist, acting on a general principle that her role is to help the patient to help himself, comes to our aid. By passive stretching of the adaptively shortened muscles, and by active exercise of their opponents, a proper balance can be gained and function restored. She can help us, too, in the post-arthritic periarticular fibrosis, by carrying out, by direction rather than at discretion, or perhaps by a little of each, assisted active movements. The patient is asked to move actively the joint in one direction as far as possible; then the masseuse gives a modicum of passive stretching at the end of the active effort. When she relaxes, the patient must hold actively the gained range of movement. Always the emphasis is on the active movement, to restore fuller strength to weakened muscles.

Such procedure has high value in restoring deformed and stiff joints after the fires of rheumatoid arthritis have died down.

Owing to the well-nigh irresistible temptation (which exists for all of us) to attempt to restore movement to a stiff joint by vigorous passive movements, it is unfair and unwise to send a patient with a stiff joint to a masseuse without a definite diagnosis of the cause of the stiffness, and without stating whether passive movement is to be used or not.

Classes of Stiff Joint.

Stiffness in a joint may be (*a*) unreal, (*b*) real, or (*c*) absolute.

Unreal Stiffness.

A joint may be unreally stiff because motion is withheld from it by the action of the will. In the rare malingerer deliberately planned muscle action stiffens it; in hysteria the suggestion of stiffness has been implanted upon a mind already disturbed by emotional storms. In the person who either is naturally super-sensitive to pain or has developed a traumatic neurosis, there may arise a state of voluntary inhibition of movement. Amongst the unreal stiffnesses one includes, too, those evanescent stiffnesses which last for a few hours to a few days after the removal of a splint which has been in every way properly chosen, applied and cared for.

Absolute Stiffness.

By absolute stiffness one means the ankylosis of joints, sound or unsound, bony or fibrous. This stiffness is for the most part complete and permanent. Such joints should never be manipulated; but occasional cases and chosen joints may be suitable for arthroplasty, or for the formation of a pseudarthrosis. In fibrous ankylosis further deformity takes place.

The elbow is a joint in which much success can be confidently expected from a pseudarthrosis. The same operation on the hip is used if both hips are ankylosed in deformity. Great toe pseudarthrosis has a use, but a very limited one.

Much orthopædic work arises from the necessity for dealing with joints ankylosed in deformity—a condition which never should have been allowed to occur. Osteotomies round the joint, for example, in the hip joint, or wedge osteotomies through the ankylosis itself to correct deformity of the knee joint, may be required.

The Cause of Ankylosis.

Ankylosis does not occur from immobilization. It may come from misuse in malposition, from the abuse of violence, or from disease; but an otherwise healthy joint does not becomes permanently stiff from the disuse imposed upon it by a splint. To counteract any fear of stiffening of a joint by prolonged lack of use during splinting, one calls to mind this quotation from Sir James Paget's essays:

> A man whose skeleton is at Marburg was encased by his relatives for twenty years in a space in which he could only sit with his limbs doubled up, and in which he could have had only very narrowly restricted movements of his joints; yet his limbs did not become deformed, and his joints retained their normal textures.

Indian fakirs maintain a joint stiff for a period of twenty years, through a religious vow; but as soon as the time has expired, the function of the joints, temporarily stiffened from disuse, gradually returns to full use. Contrast this with the sufferer from rheumatoid arthritis, whose temporo-mandibular joints, if affected, will stiffen up from disease, in spite of daily use in eating and talking. From the former it is evident that immobility does not stiffen joints, and from the latter that constant mobility does not prevent stiffness, the difference being of course that in the first case the joints were sound and healthy, and in the second they were arthritic, inflamed, unhealthy. It is the disease which produces the stiffness, not the splint.

When a wrist is broken and splints are applied, the fingers are prone to become stiff, even though their joints have been uninjured. There are two factors in this: (i) the fingers may have been splinted in full extension; (ii) brain and hand are so closely linked that a hand with its fingers immobile for more than three weeks causes such a degree of loss of voluntary brain control of the muscles governing the fingers that they (the muscles) fail to complete their range of motion when asked to act.

Real Stiffness.

In speaking of really stiff joints, one confines "stiff" to its true meaning of "not easily bent". The unbendable are the ankylosed (there is no joint). The stiff are still bendable (there is a joint). This is the first meaning arising in the mind of each of us when we think of a stiff joint.

Causes of Real Stiffness.

The causes of these stiffnesses are: (i) arthritis, (ii) adhesions, (iii) adaptive muscle shortening and (iv) faulty splinting (for example, with the elbow, a finger or a knee in quite full extension). The first and third of these have already been dealt with. As to the second, Jones defines adhesion thus:

An adhesion is a pathological band restricting the normal movement between two adjacent tissues, and it is caused by a serous hæmorrhage exudate from the blood vessels. This exudate may be either inflammatory or traumatic in origin. At first the exudate is soft and elastic; later, as its structure becomes more definitely fibrous, it loses its elasticity and becomes more dense and less vascular. An adhesion in its latest stage, therefore, is a cicatrix. If an inflamed joint be kept at rest too long after inflammation has abated, then the process of healing may lead to unnecessary bands of fibrous tissue.

The arthritis may be active (the inflamed joint of Thomas) or quiescent; there are many grades between the two. For treatment, only the first ("active") goes into the grades between. Patients with active arthritis are treated with moderated splints, plaster of Paris, "Antiphlogistine" or bandaging with adhesive plaster. This is the class in which rest is needed. The others (quiescent arthritis, with its muscle shortening, capsular thickening, and intraarticular or extraarticular adhesions) go into the class needing motion by means of manipulation.

Diagnosis Between Arthritis and Adhesions.—Let us consider the crux of this matter, namely, the diagnosis between arthritis and adhesions, the one demanding rest and the other motion, as treatment.

It is as simple as this: arthritis limits a joint's movements in all directions, whereas adhesions limit it in one direction, or some directions only, and allow free movement in other directions. In arthritis, all muscles are on guard against joint movement; adhesions provide a mechanical block to certain movements only. The detection of these differences calls for a knowledge of the normal full range of movement proper to each joint and for a keen sense of what constitutes true automatic reflex muscle spasm. This sense is something gained by the examiner's hand feeling the muscles, if possible, during examination (for example, the adductors of the hip), or watching the behaviour of the adjacent bone (for example, the pelvis when the leg is being tested or the scapula when the shoulder is being tested). It is important to remember that true muscle spasm disappears under anæsthesia, but is present during sleep. It is often, especially in workers' compensation cases, difficult to detect true muscle spasm from the voluntary prohibition or from the subconscious, perhaps involuntary, inhibition which causes muscle tightening round a joint to prevent a movement which the patient fears will hurt (from causes not associated with the joint) or to give a large functional importance to a small unimportant organic lesion. To detect the true spasm in children, one must handle ever so gently, first the good limb, then the bad one. In the examination of older patients, one, in cases of doubt, uses distraction of attention to aid in the separation of reflex spasm from voluntary tightening. The latter varies; it diminishes if the patient cooperates with you in an effort to banish it, and, conversely, it increases if he does not. It will vary during a movement. It is lessened if one distracts the attention of the patient. Ask a person with this "unreal" wrist stiffness to extend dorsally the wrist and keep an examining hand on the wrist flexor muscle tendons as well as the extensors. One finds the wrist flexors go into action sooner and more strongly than the extensors. It seems as though the flexors get set first, and then the extensors come into action afterwards. Ask a patient with pain in the lower part of the back to bend forward. In cases of true arthritis of the lumbar vertebra with muscle spasm, the *erectores spinalis* assume an almost board-like hardness on both sides as soon as movement begins. If the trouble is in one or other sacro-iliac joint, there may be the board-like hardness of the *erector spinalis* on one side only. If the patient is exaggerating his condition the erectores are tight, but not board-like. If he has adhesions, he will move freely to a point, then be brought to a standstill at a point, or the lateral motions and the rotations will be asymmetrical. To see one of the Liverpool men handling a suspected hip joint in a child is a lesson in this delicate art. In this country, with its relative freedom from the trouble, tuberculous joint lesions suitable for the display of, or the acquisition of, this finesse, do not often crop up.

TYPICAL REACTIONS SEEN IN THE SHOULDER JOINT.

In the demonstration of reactions in the shoulder joint one has to rely, in teaching, on the shoulder joints of adults to bring out the differences. There are two fairly common injuries to the shoulder joint, the first caused by a stub blow, or a wrench, the second the result of a fall on the outstretched hand (as in a complication of a Colles's fracture), or of the sort of a fall that nearly, but not quite, produced a dislocation of the shoulder. The pain of the injury from a stub blow, from being a slight ache, gradually as the weeks go by becomes more severe until it becomes well-nigh intolerable. Especially at night does it give trouble. The patient cannot lie on the affected shoulder nor on the unaffected shoulder (because as he gets nearly to sleep the affected shoulder gets a "night start"), and is reduced to sleeping on his back. In the wrench type of injury, the pain is rather severe from the outset. Each shoulder is now a stiff joint, incapable of free lively action. On examination, the first shoulder feels warm to the examiner's hand, the other feels cold. To investigate the range of movement, the examiner stands behind the patient, and feels the apex of each scapula between the thumb and forefinger of each hand. He then directs the patient to abduct the arms. In the first case the tip of the scapula will move instantly any attempt is made to move the shoulder joint, by reason of the reflex muscle spasm of the shoulder muscles. This evidence points to arthritis. In the

second case the tip of the scapula remains stationary till, say, two-thirds of the abduction movement is completed, and through this range there is no complaint of pain; but at this point the the scapula tip begins to move, and the patient complains of pain. This evidence points to the presence of adhesions. In the former, the diagnosis of arthritis is confirmed if thumb pressure over the joint between the tip of the coracoid process and the head of the humerus elicits a sharp complaint of great tenderness, showing that there is congestion of the synovial membrane.

Thus one brings out the main features of the two conditions, and one can carry the principles so learnt into the examination of other joints.

Dr. Norman Little's recent paper in THE MEDICAL JOURNAL OF AUSTRALIA brings out clearly the modes of formation of adhesions and some excellent diagnostic points.

Each joint has its peculiarities and its tendencies to develop certain types of trouble.

THE MORE CHARACTERISTIC REACTIONS OF THE VARIOUS JOINTS.

The Spine.

The spine is prone to osteoarthritic damage to its articulations, causing pain and stiffness. This is best healed by splinting, complete or modified, followed by assisted active movements, that is, a passive factor added at the end of an active movement; or in the more resistant cases, a manipulation under anæsthesia. It also suffers from aggravation of a preexisting osteoarthritis by a ligamentous injury, which imposes sufficient immobility on it to allow of periarticular thickening of the joint already in a somewhat over-strained osteoarthritic state. Ligamentous, muscular and bony injuries, in an otherwise healthy spine, are prone, after the more obvious injury has healed, to be withheld from free action by adhesions. More patients with arthritic spines come for treatment than patients whose spines are affected with adhesions.

But the reverse holds of the shoulder, and it is in the shoulder that manipulation for adhesions gives success, often dramatic.

Elbow and Wrist.

The elbow has its troubles, mostly from adhesions after injury, too, for example, tennis elbow.

The wrist has fractures of scaphoids, dislocated semilunars, ligamentous injuries, overuse arthritis, arthritis due to old fractures, infective arthritis, adhesions, ganglia, the whole gamut of joint disease.

Fingers.

The fingers are subject to many and resistant stiffnesses. Excluding Volkmann's palsy, septic infection and Dupuytren's contracture, the fingers are very prone to joint stiffness if they are badly splinted (that is, in extension), when treatment is employed either for fracture of the wrist or a finger injury. Stub blows, causing arthritis and requiring resolute splinting in C-shaped splints, often occur in sport.

The Sacro-iliac Joint.

The sacro-iliac joint may, I am convinced, suffer from subluxation, and it shares the common liability to arthritis. As it is a difficult joint to obtain clues from, mistakes in diagnosis are more common here than elsewhere.

The Hip Joint.

The hip joint has its liabilities to acute and chronic injuries, its stub blows from jumping in childhood, its epiphyseal disturbances, Perthes's disease and slipping epiphyses, its acute arthritides (tuberculous and septic) in the growing period; but one examines more hip joints for osteoarthritis in middle and old age in this country. Those patients mildly affected with osteoarthritis do well with manipulation, the moderately affected do well with drilling, the badly affected do well with Lorenz's bifurcation osteotomy.

The development of arthritis after fracture of the neck of the femur, with or without the insertion of Smith Petersen pins, is always possible. Treatment by a Thomas hip splint should be employed.

The Knee Joint.

The knee has its characteristic afflictions, notably the derangement of the menisci, simple overuse reactions, sport traumata, and sprains of the internal lateral ligament. Derangement of the menisci may or may not call for manipulation or for excision. A consideration of sprain of the internal lateral ligament opens up the question of the best treatment for sprains round a joint, which often later causes stiffness from adhesions; such stiffness is the more likely if plaster of Paris fixation is used for treatment. In these, it is necessary, first, to know for certain which is the sprained ligament, secondly, to apply a firm adhesive tape support directly over the ligament in the way best fitted to relax it, thirdly, to arrange, as one can in a sprain of the internal lateral ligament sprain of the knee joint, by an internal wedge on the heel of the shoe that the sprained ligament will be spared in walking, and, fourthly, to allow physiological use of adjacent structures, and not to fix the joint.

The middle-aged woman, overweight and with slight *genu valgum*, often comes complaining of pain and stiffness in the knees. She has the osteoarthritis brought about by overuse in an overstrained position. She wants some help by splinting and some adjustment of her shoes to enable her to take her weight in a better straight line.

The Feet.

In the feet, adhesions, from continual failure to use the full range of movement owing to static foot faults, are commoner than arthritis, and manipulation is called for more often than fixation.

It would be well for us to recognize that the manipulative treatment of joints is carried out by many who are, and by many who are not, qualified practitioners. That success is gained by the unqualified should act as an incentive rather than an irritation to us.

One hears that special trains are required to convey the large numbers of patients who seek relief for foot ailments from a man who practises in a small prairie town in Canada. His methods are to have his patients arranged like the spokes of a wheel, with bare feet pointing towards the hub. The practitioner steps into the centre of each circle, inspects the feet, "wiggles each foot with his hands", dictates a shoe formula, and walks off to the next circle. When one hears these things, the reaction is not "what a charlatan", but "what a great number of disorders of the feet are remediable by manipulation and correct shoes". Similarly, when one finds one's friends report relief of their "jinked" backs at the hands of a chiropractor, or that So-and-So has a great reputation for the treatment of arthritis because he manipulates in every case, these facts go in as evidence to me of the value of manipulation, not as evidence of human gullibility. They help to build up a confidence in oneself that if one could become, as one always hopes to become, superlatively wise in the choice of cases in which to use manipulation and, conversely, those in which manipulation should not be done, one's power to remedy stiff joints would be supreme.

Rheumatoid Arthritis.

Rheumatic and rheumatoid arthritis is so definite a clinical entity that one must single it out for special notice. What dreadful and dreaded pictures are evoked at the mention of rheumatoid arthritis, and what distortions, what agonies does it impose upon its victims!

The deformities are preventable and should be prevented. Proper splinting, by which one means Thomas's splints, which fix by indirect action and without circular compression, would, but alas, owing to the prevalence of an attitude of despair, seldom do, both prevent the deformity and aid the recovery of the joint. If the damage to the joint is very great, from the excessive amount of disease, then ankylosis will occur, not because of, but in spite of the splint; but it will occur in the position best suited for future usefulness.

A hip splint prevents flexion and adduction deformity; a bed knee splint prevents that most crippling of all deformities, flexed knees, and a walking caliper does the same for a walking patient; a right-angled foot splint preserves a foot fit to walk on; a posterior spinal support, with or without a collar, prevents the fixed forward stoop of the back and neck; a gauge halter keeps the elbow bent at the useful angle; a cock-up wrist splint and curved grooved finger splints save the patient from having gnarled, misshapen and useless hands.

There seems only one joint whose need was not completely foreseen by Thomas, and that is the shoulder joint; and that need, namely, some abduction, was supplied by the abduction arm splint, which, I believe, was advocated and used by Colin MacKenzie for the first time at the beginning of the century. He devised it from his interest in and devotion to the deltoid muscle.

Patients with the osteoarthritic type of rheumatoid arthritis do well with splint supports, or a modicum of support from flannel bandages, intermittent stinging heat (never saturation with heat), and later either assisted active movements or manipulations to increase range of motion.

Patients with the periarticular type must be treated by splinting whilst the disease is very acute, by one motion once a day when the acute symptoms are subsiding, and by manipulation when only cold periarticular fibrosis remains to restrict the range of motion. Surgically, one finds capsulectomy very useful to correct deformity.

Conclusion.

In the management of joints and their troubles, there is little place for a meticulous or finicking attitude. There is still less a place for a *laissez-faire* attitude which finds expression in the "hot air and massage" formula.

What is required, after diagnosis, is a bold policy, either of confident careful splinting with a prognosis sufficiently prolonged to ensure the last reward of rest, or a bold policy of manipulation.

STUDIES IN THE URINARY EXCRETION OF VITAMIN *C* IN CERTAIN DISEASES OF CHILDREN.[1]

By Stanley Williams, M.D.,

and

Margaret Green, B.Sc.

(*From the Children's Hospital, Melbourne.*)

We are indebted to many laboratory research workers for a large amount of information on vitamin *C* and its possible clinical applications. A. Szent-Györgyi,[(1)] winner of the Nobel Prize in Medicine, and S. S. Zilva[(2)] have opened the way for extensive experiments on human material; and it was the reports of M. A. Abbasy, L. J. Harris, S. N. Ray and J. R. Maddock[(3)] that first stimulated an inquiry into the possibilities of vitamin *C* deficiencies amongst Melbourne children.

Abbasy and others[(3)] have shown that a substance resembling vitamin *C* is excreted in the urine, and can be measured by a dye titration test; and although some doubt exists as to whether the substance measured is actually vitamin *C*, the close resemblance between the urinary substance, hexuronic acid, and synthetic vitamin *C* is now generally accepted.

Van Eeekelen[(4)] has pointed out that other substances in urine may reduce the test dye (dichlorophenolindophenol), and these should be removed before the titrations are performed.

A large volume of literature has appeared on the results of urinary estimations in various diseases, whilst more recently the estimation of vitamin *C*

[1] Read at a meeting of the Melbourne Paediatric Society on September 14, 1938.

in the blood has been performed by many workers, including M. Pijoan and F. Klemperer.[5] We propose to mention only briefly some of the previous work on these subjects.

Abbasy and others[6] concluded that an infant is below the normal vitamin *C* standard if the daily excretion of vitamin *C* is less than one milligramme, and that the average daily excretion of vitamin *C* in the urine, both for child and adult, is one to two milligrammes per stone of body weight per day.

The normal daily requirements of vitamin *C* by mouth, therefore, are at least 25 milligrammes for an adult and corresponding amounts for a child. An orange of medium size contains 30 milligrammes of vitamin *C*, so that the juice of half an orange is ample for the normal infant. There is surprisingly little variation in the excretion of vitamin *C* in individual subjects on a standard diet.

We have shown, too, that children of the same age and approximate size, on normal diets, may vary by 300% in their output of vitamin *C*, and the standard of normality for Melbourne children is difficult to assess. (Figure I.)

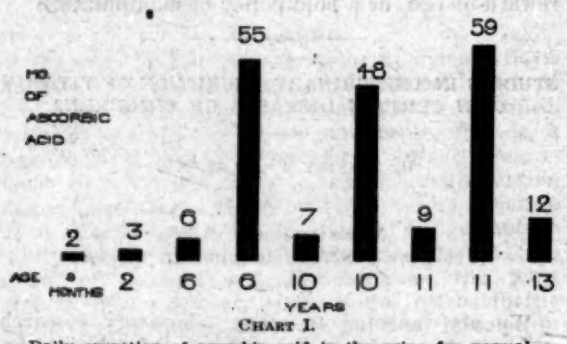

CHART I.

Daily excretion of ascrobic acid in the urine for normal children of different ages.

If the intake of vitamin *C* is below one to two milligrammes per stone of body weight, the excretion is at first still maintained, and there must be a depletion of the vitamin from the tissues. This can be shown by the oral administration of a test dose of synthetic vitamin *C* (ascorbic acid) and measurement of the urinary output. If the tissues are not deficient, as much as 80% of ascorbic acid is excreted in twenty-four hours, whilst if there is a deficiency of vitamin *C* in the tissues, a larger proportion of the test dose is absorbed and very little is excreted.

Abbasy and others have also shown that there is a decrease in the vitamin *C* excreted during certain infections. In this regard it is suggested that the vitamin *C* is used up during the infection; and some authors state that a lack of vitamin *C* may be the predisposing factor in the disease.

When the vitamin has been absent from the diet or only taken in inadequate amounts for some months, the clinical condition of scurvy may develop; and on the work of L. J. Harris and H. W. Ray,[7] it is suggested that there may be many cases of subclinical scurvy.

The functions of vitamin *C* in maintaining health are by no means definite; but one suggested association is the control of capillary permeability (I. S. Wright and A. Lilienfeld[8]). These writers consider that many diseases in which symptoms of bleeding occur, for example, purpura, stomatitis, colitis, are associated with subclinical scurvy.

The capillary resistance test has been used by these observers, and also by Göthlin,[9] as an indication of the vitamin *C* content of the tissues; but it appears that there are so many factors concerned in capillary permeability that it would seem to us over-zealous to regard the capillary resistance test alone as a measure of the vitamin *C* content of the tissues.

F. Marsh[10] states that he has shown experimentally that vitamin *C* plays a prominent part in certain immunological processes, and indicates that ascorbic acid may be a precursor of serum complement. For that and other reasons, ascorbic acid tablets have been advocated in the treatment of many infections, including pneumonia and diphtheria. In this direction it would seem that commercial enterprise is ahead of experimental justification for the general use of these synthetic products.

The recent report of Elmby and Warburg[11] indicates that a co-vitamin is necessary for the absorption of vitamin *C*, and the name given by Szent-Györgyi[12] is vitamin *P*.

Although our results show that there is a vitamin *C* lack in some of the children investigated, we have been unable to demonstrate by the urine excretion test that a deficiency of vitamin *C* plays a large part in malnutrition or disease in children.

Details of the Tests.

The method of estimation of vitamin *C* in the urine has been that recommended by Harris and Ray.[13] The urine was stored in dark bottles, with 10% acetic acid added, specimens obtained during the day being tested as soon as possible after being passed. The collection of a full twenty-four-hour specimen of urine was a difficulty we overcame occasionally by catheterization, and in the infant males by strapping a test tube to the penis.

Dr. Harris, in a personal communication, and in the literature (L. J. Harris and H. W. Ray[7]), realizing the difficulties of collecting several specimens of urine from infants, indicated that information could be obtained from the test of one daily specimen. The average daily output of urine for infants of a similar age could then be applied to these single specimen results.

The application of the test dose gives more information on the vitamin *C* content of the tissues. We have used "Redoxon" ascorbic acid tablets; each tablet contains 50 milligrammes of ascorbic acid, and the dose given is calculated on 70 milligrammes of ascorbic acid per stone of body weight. If the child was bedridden an approximate estimation of weight was made.

The group of normal children were in-patients at the Children's Hospital, Melbourne, chiefly suffer-

ing from fractures, and their diet included fresh fruit, milk and vegetables. A twenty-four-hour specimen of urine was collected, and the vitamin *C* content was estimated; then the ascorbic acid tablets were administered by mouth, and the urine was collected for a further twenty-four hours.

In many instances, a second test dose of vitamin *C* tablets was given, and the urinary excretion was estimated. The results obtained show that while many normal children excrete a large proportion of the test dose, some children retain a big percentage; a graph indicates the proportion excreted (Figure II).

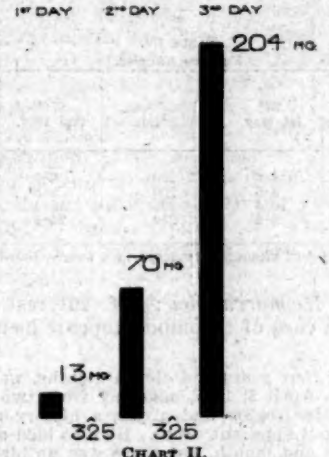

CHART II.
Daily excretion of ascrobic acid in urine after test dose in a normal child. The figures between the columns indicate the amount of ascorbic acid given orally in the test dose.

Other normal results are shown in Table I.

TABLE I.

Initials of Child.	Age. (Yrs.)	VC 1st Day.	Test Dose. (Milligrammes.)	VC 2nd Day.	VC 3rd Day.
J.F. ..	13	13·2	450	4·1	30·7
S.S. ..	11	13·3	325	70·0	203·0
A.W. ..	6½	55·4	175	39·3	52·2
G.B. ..	6	31·6	175	29·6	55·0
D.W. ..	10	47·7	325	91·6	106·5
D.B. ..	12	38·9	425	41·9	95·0

VC = Milligrammes of vitamin *C* excreted in twenty-four-hour specimen of urine.

Ascorbic acid sometimes acts as a diuretic, as we observed in comparing the volume of urine passed before and after the test dose of ascorbic acid. This diuretic action has been recorded by W. Evans,[13] who recommends ascorbic acid for the promotion of diuresis in the treatment of heart failure.

When conclusions are being drawn from the results of these urine tests, certain factors which may interfere with the accuracy of the estimations must be considered. G. W. T. Fleming and others state that even when 50% acetic acid is added to the urine there is a considerable loss of measurable ascorbic acid in twelve hours.

The influence of a meat diet, whereby the reducing substance in the urine is increased by the purines, is mentioned by Ahmad[15] as causing another possible discrepancy in the urinary estimations.

We find it difficult to draw conclusions from some of the urine tests, for we have obtained apparently abnormal findings in apparently normal children (Table II). The child E.W. was alleged to have received a diet containing at least half an orange and fresh vegetables daily, while it is seen that his excretion tests may indicate a vitamin deficiency. We consider it an exaggeration to regard this child as suffering from subclinical scurvy, and prefer the more descriptive term of unsaturation of the tissues with vitamin *C*.

With regard to the child A.H., in the same table, we find that he was quite a normal child, who had an adequate diet including fresh fruit. The first series of tests shows an apparent vitamin deficiency. His mother was advised to give him the juice of one and a half oranges a day for one month. The second series of tests revealed no abnormality. Again, we can regard this child as having an unsaturation of the tissues with vitamin *C*. It seems possible, however, that the existence of normal health does not depend on a complete saturation of the tissues with vitamin *C*.

The Consideration of Individual Diseases.

Stomatitis.

The ætiology of stomatitis is indefinite, and infection with a Vincent's bacillus or streptococcus may produce the small ulcerations, sponginess and hæmorrhage of the gums, so typical of the disease. The infants and children are often thin and very irritable; and as many attending the out-patient department of the Children's Hospital are apparently under-nourished, we decided that an inquiry into the vitamin *C* excretion of such patients might reveal a deficiency. Full results are contained in Table III, whilst two typical charts are shown (Figure III).

A close study of the figures shown in Table III will show that the child W.B. absorbs a large proportion of the test dose, and that R.S. excretes only a

TABLE II.

Initials of Child.	Age. (Years.)	VC.[1] 1st Day.	Test Dose. (Milligrammes.)	VC 2nd Day.	VC 3rd Day.	Comments.
E.W.	2	3·4	125	2·0	1·2	
A.H.	5	6·1	175	4·8	7·0	After treatment with the juice of 1½ oranges per day for a month.
		41·4	175	115·4	118·5	
G.T.	2½	4·2	100	2·8	1·1	

[1] VC = Milligrammes of vitamin *C* excreted in a twenty-four-hour specimen of urine.

TABLE III.
Patients with Stomatitis.

Initials of Child.	Age. (Years.)	VC[1] 1st Day.	Test Dose. (Milligrammes.)	VC 2nd Day.	VC 3rd Day.	Comments.
J.G.	1	2·0	—	—	—	One twenty-four hour specimen of urine. No test dose.
K.M.	9	5·0	250	15·2	51·6	
L.B.	4	4·7	150	14·8	28·9	
W.B.	5	5·0	200	6·5	18·9	
R.S.	8	13·7	175	36·9	16·9	
R.P.	1	2·5	—	—	—	One twenty-four-hour specimen of urine. No test dose.
R.S.	5	4·5	150	30·1	34·0	
N.M.	9	21·2	200	17·3	48·0	
E.M.	8	13·6	225	16·6	37·2	

[1] VC = Milligrammes of vitamin C excreted in a twenty-four-hour specimen of urine.

small proportion of the second test dose. This is possibly suggestive of vitamin C unsaturation. The infants, J.G. and R.P., have excreted normal amounts if we accept the figure of one to two milligrammes per stone of body weight. The mechanical difficulties of obtaining second specimens of urine prevented the study of a response to the test dose in those children.

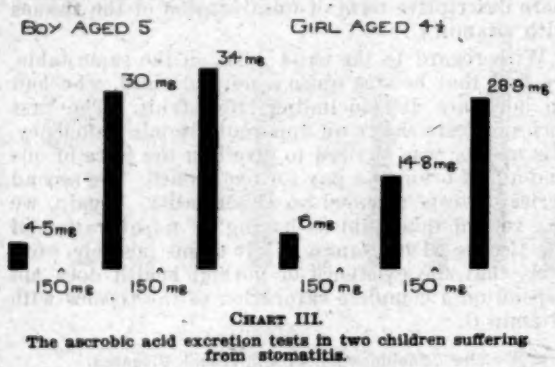

CHART III.
The ascrobic acid excretion tests in two children suffering from stomatitis.

The remainder of the children represented in Table III do not demonstrate any significant deficiency of vitamin C, and cannot be regarded as examples of subclinical scurvy.

Purpura.

Classification of the various forms of purpura is more difficult because the ætiology is often unknown. The one outstanding clinical feature is the tendency for bleeding from the capillaries of the skin and mucous membranes. If this is due to an increase in capillary permeability, the association with vitamin C tissue content is worthy of investigation.

With *purpura simplex*, when the child has multiple petechiæ, perhaps after a mild illness, and examination reveals no reduction of the normal number of blood platelets, and when there is no enlargement of the spleen, a toxic cause is often written as the explanation.

We have had the opportunity of estimating the urinary vitamin C excretion of four such patients. Two of them gave results that are on the borderline of abnormality (L.F. and L.P. in Table IV). There is thus insufficient evidence to postulate a vitamin C deficiency as the cause of the purpura in these patients.

TABLE IV.
Purpura Simplex.

Initials of Child.	Age. (Yrs.)	VC 1st Day.	Test Dose. (Milligrammes.)	VC 2nd Day.	VC 3rd Day.
L.F. ..	7	4·6	200	8·0	36·1
L.P. ..	7	3·5	200	8·5	44·0
O.B. ..	8	10·4	225	16·4	—
J.R. ..	9	5·2	250	24·1	—

VC = Milligrammes of vitamin C excreted in a twenty-four-hour specimen of urine.

Purpura Hæmorrhagica: Of interest are the findings in a case of thrombocytopenic hæmorrhagic purpura.

A boy, aged four years and eleven months, was admitted to hospital on April 5, 1937, suffering from two bruises in the left shoulder region and giving a history of frequent bruising without apparent cause. He also bled occasionally from the nose and mouth, but there was no bleeding from the bowel.

On examination, in addition to the shoulder bruises, recent bruises were to be seen over the left iliac crest and in the right groin. There were purpuric spots over his back, bleeding from the gums, and some decay of the right lower molar teeth. His tonsils were enlarged and had purpuric spots on them. There was no enlargement of the spleen.

Blood examination revealed 4,000,000 erythrocytes and 10,000 leucocytes per cubic millimetre. The hæmoglobin value was 80% (11·3 grammes per 100 cubic centimetres). The bleeding time was seven and a half minutes, and the coagulation rate was normal. Examination of a blood film revealed no platelets.

Ascorbic acid tests were carried out with the urine, and elicited the following results:

First day: 2·4 milligrammes (test dose = 175 milligrammes).
Second day: 3·3 milligrammes.
Third day: 4·8 milligrammes.

The child was then given two ascorbic acid tablets and the juice of two oranges daily for one month. The tablets were discontinued and the orange juice was relied on for the chief source of vitamin C, for a further six weeks. The ascorbic acid test of the urine was repeated, with the following results:

First day: 6·8 milligrammes (test dose = 175 milligrammes).
Second day: 13·2 milligrammes.
Third day: 34·7 milligrammes.

This is a normal excretion.

Blood examination again showed that there were no platelets present.

On the same diet the boy remained quite well for several months; then, in spite of his having oranges and tomatoes daily, bruising over the left iliac crest and sponginess of the gums developed.

From the clinical notes it may be seen that this child should be regarded as suffering from thrombo-

cytopenic purpura, although there was no enlargement of the spleen. One could postulate from the urinary excretion test results that he had vitamin *C* deficiency, which increased the capillary permeability, and that the blood platelets were used up in an attempt to prevent tissue hæmorrhage.

The fact that he improved, both clinically and as shown by the ascorbic acid tests, when given ascorbic acid tablets and orange juice, does not prove that his illness was due to vitamin *C* deficiency; for it is well known that in the normal cycle of this disease, temporary improvement readily takes place with the usual forms of treatment.

H. Englekes[16] has reported the success of synthetic ascorbic acid, in the form of "Redoxon" tablets, in hæmorrhagic disorders, including essential thrombocytopenic purpura and purpura causing hæmaturia. Whilst our patient was still being treated with large amounts of vitamin *C*, superficial hæmorrhages developed. It is possible that a clearer conception of the cause of the hæmorrhage may ensue after further application of the work of Dam and Glavind[17] with vitamin *K*. Perhaps, too, the "vitamin of permeability" of Szent-Györgyi,[12] [18] mentioned recently in a case of Schonlein-Henoch purpura, may add yet another therapeutic substance for use in the treatment of purpura.

Scurvy.

In view of the fact that scurvy is generally accepted as being due to vitamin *C* deficiency, our findings are of interest.

In one case of typical clinical scurvy, confirmed radiologically, the results of tests on the patient (K.A.), shown in Table V, indicate that the normal level of excretion of one to two milligrammes of ascorbic acid per stone of body weight was present, but that the test dose indicated an absorption in the tissues more pronounced than normal. There was clinical improvement with ascorbic acid tablets, 100 milligrammes being given per day.

A similar deficiency is indicated in an infant, aged eight months, who died in hospital from an intercurrent infection.

A third infant with scurvy, who weighed 6·3 kilograms (fourteen pounds), and excreted only 0·4 milligramme of ascorbic acid in twenty-four hours before the test dose, did not respond clinically to the administration of ascorbic acid tablets. On the suggestion of Dr. J. W. Grieve he was given first, intramuscular injections of ascorbic acid, without improvement, and then orange juice, with subsequent improvement. In spite of the lack of clinical improvement on tablets, there was a daily urinary excretion of 16·1 milligrammes.

The explanation of this phenomenon may be that the synthetic vitamin had not been absorbed into the tissues, or that the clinical manifestations of scurvy were not entirely due to vitamin *C* deficiency. Perhaps there is an underlying condition of rickets in some of these children. We read of this in the original article of Thomas Barlow,[19] who states that in scurvy there is a variable element of rickets.

The lack of response to synthetic ascorbic acid has also been commented upon by Elmby and Warburg[11] in their report of three scorbutic patients who improved clinically and showed an increased amount of ascorbic acid in the blood only after the administration of lemons.

The Intradermal Test for Vitamin C Deficiency.

The intradermal test for vitamin *C* deficiency was described by Rotter,[20] and given in detail in a paper by Portnoy and Wilkinson.[21]

With the assistance of Dr. J. Gabriel, a series of intradermal injections of the dye (dichlorophenol-indophenol) were made in normal controls, and in children suffering from acute infections, dietetic dyspepsia and scurvy. In all cases the dye was decolorized within three minutes. Of some interest is a series of six children suffering from diphtheria, and examined at the Queen's Memorial Infectious Diseases Hospital, with the kind permission of the medical superintendent, Dr. F. V. Scholes. The decolorization of the dye in these children occupied five minutes, a longer period than with our normal controls. We do not propose to offer an explanation for these findings; but, basing our opinion on the normal decolorization time found in tests on infants with scurvy, we feel that the intradermal test is of doubtful value.

TABLE V.
Scurvy.

Initials of Child.	Age. (Months.)	VC[1] 1st Day.	Test Dose. (Milligrammes.)	VC 2nd Day.	VC 3rd Day.	Comments.
K.A.	10	1·2 5·8	75	1·1	1·9	After treatment with 100 milligrammes of ascorbic acid per day; one twenty-four-hour specimen.
M.S.	8	0·8	75	0·8		Died.
V.O.	10	0·4 16·1	100	0·8	0·8	After treatment for three weeks with ascorbic acid tablets, 100 milligrammes per day.

[1] VC = Milligrammes of vitamin *C* excreted in a twenty-four-hour specimen of urine.

Discussion.

That the condition of avitaminosis exists is accepted on general grounds; but in a condition that is indicated by stomatitis there seems to be some considerable doubt of its being associated with vitamin *C* deficiency. We doubt if there is much deficiency of vitamin *C* in children in Melbourne; but we believe that the natural products, such as fruit and fresh vegetables, are essential for all children, especially if under-nourished or suffering from an acute infection.

There is some doubt as to the presence of sub-clinical scurvy, and there is no indication for the use of large doses of ascorbic acid in such a disease as stomatitis.

Parsons[22] has stated that scurvy is the only disease which we know at present to be due to vitamin *C* deficiency.

On the results of our findings in a small series of cases, however, even that statement is open to question. We consider that while the part played by vitamin *C* in disease in children has not been substantiated, further investigation is required by means of blood ascorbic acid estimations and intravenous test doses.

Summary.

1. The literature dealing with the urinary excretion test for vitamin *C* is reviewed.

2. The possible functions of vitamin *C* are discussed.

3. Details are given of the investigation of children suffering from stomatitis and purpura. There is no evidence that these diseases are due to a deficiency of vitamin *C*.

4. Two of three patients with scurvy showed a depression of urinary excretion of vitamin *C* below normal limits, and improved with the administration of synthetic vitamin *C*. In the third case fresh orange juice appeared superior to the synthetic product for treatment.

Acknowledgement.

We are grateful to the members of the honorary medical staff at the Children's Hospital, Melbourne, and at the pædiatric department of the Alfred Hospital, Melbourne, for permission to carry out investigations on patients under their care, and to Dr. Reginald Webster and the resident medical officers of these hospitals for their interest and assistance. We have been helped in the preparation of the paper by Dr. E. V. Keogh.

The painstaking collection of specimens by the members of the nursing staff at the Children's Hospital, Melbourne, has made this work possible.

We are indebted to Messrs. Hoffmann-la-Roche, Proprietary, Limited, for the supply of "Redoxon" ascorbic acid.

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THE ROLE OF THE BANDICOOT IN THE EPIDEMIOLOGY OF "Q" FEVER: A PRELIMINARY STUDY.

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BANDICOOTS[1] are amongst the most common animals of the bush, and in the search for a possible reservoir of "Q" fever infection, they have early come under investigation. This report is based on

[1] The bandicoots of the Australian region represent a family (the Peramelidæ) of the marsupials. There are nine genera widely distributed throughout Australia and adjacent islands. They are sometimes, but quite erroneously, regarded as rodents. In their powerful hind legs and prominent middle toe they resemble the kangaroo group, but they are definitely separated therefrom by the different arrangement of their teeth, by their internal anatomy, and by their habits. They are largely insectivorous, being particularly fond of beetle larvæ. They are easily kept in captivity, and may be fed on meat and bread and milk.(1)

the study of 50 bandicoots, of which 41 were captured in the Nambour district, seven at Cowan Cowan on Moreton Island and one each at Maleny and Imbil. All belonged to the species *Isoodon torosus* Ramsay (Figures I and II).

The sex and weight of the 50 bandicoots are shown in Table I. The largest was a male, weighing 2,577 grammes. The largest female weighed 1,706 grammes.

TABLE I.
Sex and Weight of Bandicoots.

Weight. (Grammes.)	Number of Males.	Number of Females.	Total Number of Animals.
0 to 500	3	2	5
500 to 1,000	5	8	13
1,000 to 1,500	3	7	10
1,500 to 2,000	11	1	12
Over 2,000	9	0	9
Not recorded	0	1	1
Total	31	19	50

When a bandicoot was received at the laboratory in Brisbane the usual procedure was to kill it, weigh and measure it, search it for external and internal parasites, take blood from the heart for agglutination tests, weigh and measure the spleen, examine the kidney for leptospiræ by dark-ground illumination, and inject a guinea-pig with a mixed emulsion of spleen, liver and kidney. In the case of some bandicoots, particularly those captured early in the series, the full procedure was not carried out. Thirteen of the bandicoots were kept alive temporarily for inoculation or other purposes. Blood samples were obtained from most of these by heart puncture.

FIGURE I.
Isoodon torosus Ramsay, male.
Weight, 1,580 grammes. Length of head and body, 421 millimetres. Length of tail, 166 millimetres.

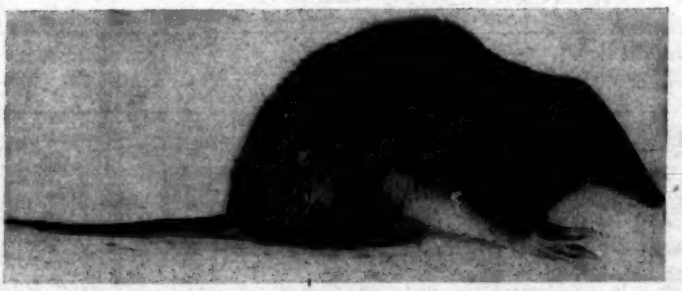

FIGURE II.
Isoodon torosus Ramsay, female.
Weight, 810 grammes. Length of head and body, 321 millimetres. Length of tail, 124 millimetres.

The samples of serum were sent to the Walter and Eliza Hall Institute, Melbourne, where the agglutination and mouse protection tests were performed by M.F. The remainder of the work was done in Brisbane.

The Susceptibility of the Bandicoot to "Q" Fever.

Bandicoots 8 and 9, both female, came to the laboratory in their mother's pouch, and were reared for a time in captivity. As they had had very little, if any, opportunity of naturally acquiring "Q" fever infection in the bush, they were suitable for experimental inoculation. The mother was trapped at Maleny on October 2, 1937. The young ones were first noticed to come completely out of the pouch on October 28.

Bandicoot 8 was inoculated intraperitoneally with three mils of infective guinea-pig spleen and liver emulsion on December 10, when it weighed 312 grammes. A guinea-pig weighing 230 grammes injected with half the dose reacted strongly. Bandicoot 8 did not develop any fever or appear ill. The slight reaction on the second day (shown in Figure III) was not due to "Q" fever, as an uninoculated control bandicoot also showed it.

On the seventh day after inoculation one mil of blood was withdrawn from the heart and injected into a guinea-pig, which reacted. On the tenth day the bandicoot was killed. Its weight was then 295 grammes. The spleen was enlarged, weighing 3·24 grammes, or 1·10% of the body weight. Guinea-pigs injected with blood and spleen and liver emulsion reacted typically with "Q" fever (Table II).

Bandicoot 9 was inoculated with five mils of guinea-pig spleen and liver emulsion on February 1, 1938. It then weighed 518 grammes. One mil of this emulsion infected a guinea-pig weighing 300 grammes.

There was no sign of illness in bandicoot 9 after inoculation. The slight increase in temperature on the sixth day, as shown in Figure III, is not regarded as significant. The bandicoot was killed on the seventh day, when it weighed 535 grammes. The spleen was moderately enlarged, weighing 4·5 grammes, equal to 0·84% of the body weight. Guinea-pigs were injected with organ emulsions as shown in Table II, and the "Q" fever virus was

found to be present in as little as 0·01 gramme of blood, spleen and liver.

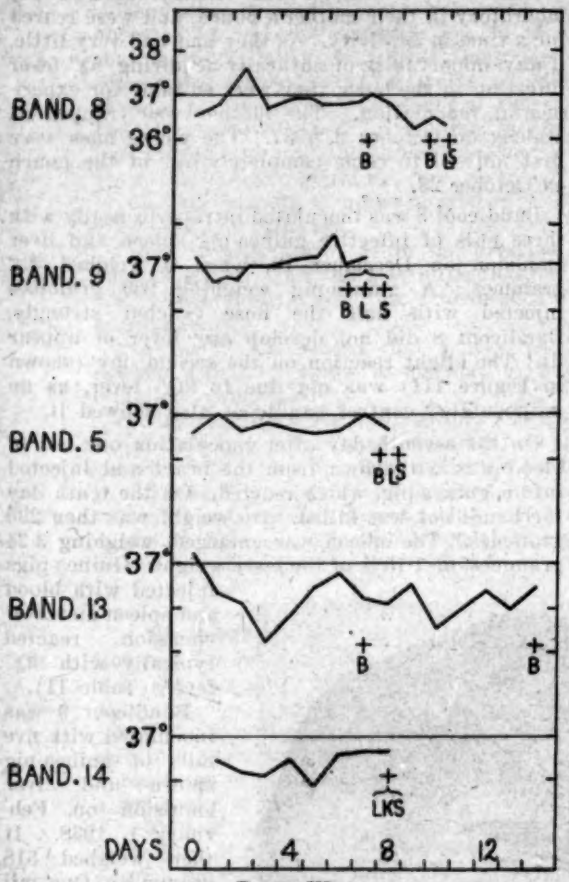

FIGURE III.

Temperature charts of five bandicoots experimentally infected with "Q" fever. Each bandicoot was inoculated on day 0. The sign "+" indicates successful subinoculation of a guinea-pig with bandicoot material. *B* = blood; *L* = liver; *S* = spleen; *K* = kidney.

Seven other bandicoots, three male and four female, have been inoculated with "Q" fever material. None of them showed any febrile response, sign of illness or significant change in weight. From three of the females (numbers 5, 13 and 14), "Q" fever virus was reobtained from blood or organs by guinea-pig inoculation. Guinea-pigs inoculated with material from the other female (number 30) died of some intercurrent infection, probably a salmonella. There was no evidence that the three males became infected.

These experiments show that the bandicoot is susceptible to "Q" fever, that it takes the infection in an unapparent form, and that the infective agent may be present abundantly in the blood and organs.

"Q" Fever Agglutination Tests with Bandicoot Sera.

The sera of 44 uninoculated bandicoots have been tested for agglutinins to "Q" fever. Four gave positive results, which are shown in Table III.

TABLE III.

Agglutination Tests on Sera of Uninoculated Bandicoots.

Number of Bandicoot.	Serum Dilution.		
	1 in 10.	1 in 30.	1 in 100.
2	++	+++	–
17	+++	+++	+
24	+++	+++	–
25	++	+++	–

The agglutination test technique has been modified since it was reported (Burnet and Freeman, 1938). It is now as follows.

The spleens or livers of heavily infected mice are ground to a paste with quartz powder and emulsified in saline solution, two cubic centimetres being used for each liver and one cubic centimetre for each spleen. The cells and quartz are removed from this emulsion by centrifugation for five minutes in an angle centrifuge. The supernatant fluid is then spun for an hour to deposit the Rickettsiæ. After being washed with saline solution, the deposit is reemulsified in a small volume of saline solution, about one

TABLE II.

Results of Inoculation of Guinea-pigs from Bandicoots 8 and 9.[1]

	Weight of Test Guinea-pig. (Grammes.)	Inoculum.	Result.	Remarks.
Bandicoot 8.	270	Blood (7th day), 1 ml.	+	Five days' fever, then passaged into a test pair. The new one got an inapparent infection and the immune one remained afebrile.
	230	Blood (10th day), 2·5 mls.	+	Five days' fever, later found immune.
	258	Spleen and liver emulsion, 1·5 mls.	+	Four days' fever, then passaged into a test pair. The new one reacted typically and the immune one remained afebrile.
	369	Spleen and liver emulsion, 2·8 mls.	–	Immune control guinea-pig. No fever.
Bandicoot 9.	214	Blood, 2 mls.	+	Five days' fever, then passaged into a test pair. The new one reacted typically and the immune one remained afebrile.
	270	Strong spleen and liver emulsion, 1·5 mls.	+	Four days' fever, later found immune.
	359	Strong spleen and liver emulsion, 2·2 mls.	–	Immune control guinea-pig. No fever.
	182	Spleen, 0·01 gramme.	+	Two days' fever, later found immune.
	212	Liver, 0·01 gramme.	+	Four days' fever, later found immune.
	228	Brain, 0·01 gramme.	?	Died on 9th day from intercurrent disease.
	260	Kidney, 0·01 gramme.	–	No significant fever, later found not immune.
	190	Blood, 0·01 gramme.	+	Five days' fever, later found immune.

[1] The immunity tests were all performed at least six weeks after the first inoculation.

cubic centimetre for each heavily infected liver and 0·5 cubic centimetre for each spleen. A little acetic acid is added to bring the reaction to pH 6, and the emulsion is heated at 45° C. for thirty minutes. The resultant flocculent precipitate can then be centrifuged down in two to three minutes, and after neutralization the supernatant fluid is suitable for use for agglutination tests. Better emulsions can be obtained from livers than from spleens. Stained smears of the liver extracts show nearly 100% Rickettsiæ. Extraneous matter is always present in the spleen emulsion.

The agglutination test is performed as follows: an equal volume (0·05 cubic centimetre) of the agglutinating emulsion is added to the diluted sera, and they are left at 45° C. for five to six hours and then at room temperature overnight. Final readings are taken next morning, a hand lens being used. The details of readings are as follows:

+++ = Heavy agglutinate, supernatant liquid clear. Coarse aggregate when resuspended by gentle shaking.

++ = Heavy agglutinate, supernatant liquid nearly clear. Moderately coarse aggregate when resuspended.

\+ = Some agglutinate, supernatant liquid still opalescent. Fine aggregate when resuspended.

It will be noted that in two of the sera a slight inhibition zone is present, in that the agglutination with serum diluted to 1 in 10 is less pronounced than with serum diluted to 1 in 30.

The four reacting bandicoots were caught at Cooloolabin, Nambour, and Cowan Cowan (two). Thus, of 37 bandicoots tested from the Nambour district, two reacted, and of five tested from Cowan Cowan two reacted. The high proportion in the small Cowan Cowan series calls for further investigation of this area.

In two bandicoots experimentally inoculated with "Q" fever agglutinins developed, as is shown in Table IV.

TABLE IV.

Agglutination Tests on Sera of Experimentally Inoculated Bandicoots.

Number of Bandicoot.	Day after Inoculation.	Serum Dilution. 1 in 10.	1 in 30.	1 in 100.
13[1]	0	−	−	−
	14	+++	+	−
	21	+++	−	−
	28	+++	+	−
	42	−	−	−
30[2]	0	−		
	7	−		
	14	−		
	23	+++	+	
	59	−		

[1] Bandicoot 13 died, apparently of pneumonia, on the forty-sixth day.
[2] Bandicoot 30 died, apparently of pneumonia, on the sixty-sixth day.

Protection Tests on Mice with Bandicoot Sera.

The spleen of a mouse infected with "Q" fever was emulsified by being ground with quartz powder, and the resultant smooth paste was suspended in five cubic centimetres of broth. This emulsion was allowed to settle for thirty minutes in the refrigerator. A 1 in 100 dilution of the supernatant fluid was made with broth, and to it were added equal volumes of tenfold dilutions of the sera to be tested. The mixtures were left in the refrigerator for one hour, and then 0·25 cubic centimetre of each was inoculated intraperitoneally into mice, aged eight weeks. Four mice were used for each dilution. The mice were killed in ten days, and smears of the livers and spleens, stained by Castaneda's method, were examined for the presence of Rickettsiæ. The results are given in Table V. It is clear that bandicoot sera that react to agglutination tests are also capable of protecting mice against infection with "Q" fever.

TABLE V.

Mouse Protection Tests with Bandicoot Sera.

Number of Bandicoot.	Serum Dilution.	Presence of Rickettsiæ in Mice.
10 (Control)	10^{-1}	+++,[1] ++,[2] +,[3] +
2	10^{-1}	Few, −, −, 1 died.[4]
	10^{-2}	−, −, 2 died.[4]
	10^{-3}	+++, ++, +, +
25	10^{-1}	−, −, −, 1 died.[4]
	10^{-2}	−, −, −, −
	10^{-3}	+++, ++, +, +

[1] +++ = Many Rickettsiæ seen in each microscopic field.
[2] ++ = Rickettsiæ found in every two to three fields.
[3] \+ = Rickettsiæ present, but not in large numbers.
[4] Non-specific deaths of mice were probably due to infection by *Bacillus pseudotuberculosis rodentium*.

Protection Tests on Guinea-Pigs with Bandicoot Sera.

The presence of antibodies in the sera of two of the bandicoots was confirmed by guinea-pig protection tests. In these tests one mil of an infected guinea-pig liver emulsion was mixed with one mil of undiluted bandicoot serum and with one mil of various dilutions of the serum. The mixtures were allowed to stand for half an hour at room temperature and then injected into guinea-pigs. Two guinea-pigs were used for each dilution. Protection was evidenced by the guinea-pig's remaining afebrile.

The results (Table VI) show strong protection with the serum of bandicoot 25, and some protection with that of bandicoot 17.

The Search for the Infecting Agent of "Q" Fever in Bandicoots and Their Parasites.

From each of 28 bandicoots a mixed emulsion of spleen, liver and kidney was prepared and injected into a guinea-pig. Blood from another bandicoot was injected. None of the guinea-pigs showed any abnormal rise of temperature during fourteen days. Each guinea-pig was then killed, and a liver and spleen emulsion from it was injected into another guinea-pig. None of the second passage animals reacted. These 28 bandicoots included only one (number 17) of the four showing "Q" agglutination.

Bandicoots are notorious for the parasites they carry. Table VII lists the ectoparasites that we have found on them. Representative samples (except of the Listrophoridæ) were ground up in broth and injected into guinea-pigs. The numbers in the table are of the parasites injected. Many more were saved for identification and other purposes. None of the guinea-pigs, either of the first or second passage, developed "Q" fever.

TABLE VI.

Guinea-Pig Protection Tests with Bandicoot Sera.

Number of Bandicoot.	Serum Dilution.	Fever in Test Guinea-Pigs.			Protection.
		Duration (Days).	Maximum Temperature (Centigrade).	Incubation Period.	
—	No serum.	5 5	41·3° 41·2°	7 6	
29 (Control)	Undiluted.	1 5	40·6° 41·3°	10 8	Partial. —
25	Undiluted.	No fever. No fever.			+ +
	10^{-1}	No fever. No fever.			+ +
	10^{-2}	3 No fever.	40·8°	12	— +
	10^{-4}	3 4	40·9° 41·1°	9 10	— —
17	Undiluted.	No fever. No fever.			+ +
	10^{-1}	3 4	40·7° 40·6°	10 11	— —
	10^{-2}	5 3	40·8° 40·8°	10 12	— —
	10^{-3}	7 4	41·8° 41·2°	7 9	— —

TABLE VII.

Ectoparasites of Bandicoots.

Order.	Parasite.	Number of Parasites Injected.	Number of Guinea-pigs Inoculated.
Anophura ..	*Boopia* species	1,000[1]	8
Siphonaptera	*Stephanocircus dasyuri* ..	39	31
	Pygiopsylla species ..	66	
Acarina ..	*Ixodes holocyclus*	198	44
	Haemaphysalis humerosa	39	12
	Haemaphysalis spinigera, variety *novae-guineae*	6	2
	Heterolaelaps antipodianum	Several	2
	Mesolaelaps australiensis	292	26
	Hypoaspis peramelis		
	Neoschöngastia isoodon ..	161	18
	Neoschöngastia kallipygos ..	—	—
	Listrophoridæ, species nova	—	—

[1] Approximate figure.

Examination of Bandicoot Spleens.

An increase in the size of the spleen is a practically constant feature of "Q" fever infection in guinea-pigs, rats and mice. Attention was therefore given to the size of the spleens of the captured bandicoots as a possible indication of natural infection. The spleens were weighed and measured. The weight of the spleen in relation to the body weight appeared to give the most satisfactory index of spleen size.

The spleen of a bandicoot has a curious branched shape (Figure IV). A small spleen has a striped or ribbed appearance due to the alternation of light and dark rows. Each light row is raised and contains as a core an elongated Malpighian body. In a large spleen the hyperplasia of the pulp fills out the hollows and tends to obscure the Malpighian bodies. The surface of the spleen is then smooth and uniformly dark red.

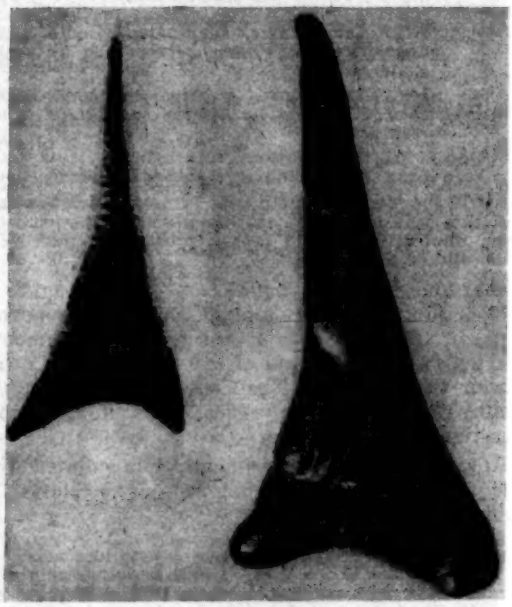

FIGURE IV.

Bandicoot spleens. On the left is a small spleen, 83 millimetres in length and 2·7 grammes in weight, or 0·3% of the body weight. This spleen was photographed with transmitted light, which has somewhat accentuated the striped appearance. On the right is a rather large spleen, 126 millimetres in length and 14 grammes in weight, or 0·6% of the body weight.

Among 37 spleens, the smallest was 0·12%, the largest 1·59%, and the average 0·51% of the body weight. The second, 1·59%, was an exceptionally high figure, the next largest being 1·07%. Figure V shows the frequency distribution of the percentage of body weight of 36 spleens (excluding the one of which the percentage was 1·59). The peak comes between 0·2% and 0·4%. It is noteworthy that the spleens of the youngest bandicoots, those weighing under 1,000 grammes, were all below the average of 0·51%, and that the spleens of the largest, those weighing over 2,000 grammes, were all but one over the average. The spleens of the intermediate bandicoots were spread more widely.

These figures may be compared with those in Table VIII, which shows the spleen sizes of bandicoots experimentally infected with "Q" fever. The

table does not include the three bandicoots unsuccessfully inoculated.

A bandicoot with active "Q" fever may, therefore, be expected to have a spleen heavier than the average of 0·51% of body weight. Many of the captured bandicoots did, in fact, have rather large spleens, in the range of those shown in Table VIII.

TABLE VIII.
Size of Spleens of Bandicoots Infected with "Q" Fever.

Serial Number of Bandicoot.	Sex.	Body Weight. (Grammes.)	Number of Days after Inoculation that Spleen was Examined.	Weight of Spleen. (Grammes.)	Percentage of Body Weight.
8	F.	295	10	3·24	1·10
9	F.	535	7	4·5	0·84
5	F.	1,071	8	7·0	0·65
14	F.	1,706	8	12·4	0·73
13	F.	908	46	5·5	0·61

But the failure of guinea-pig inoculation shows that the splenic enlargement was not due to active "Q" fever. Its actual cause was not determined.

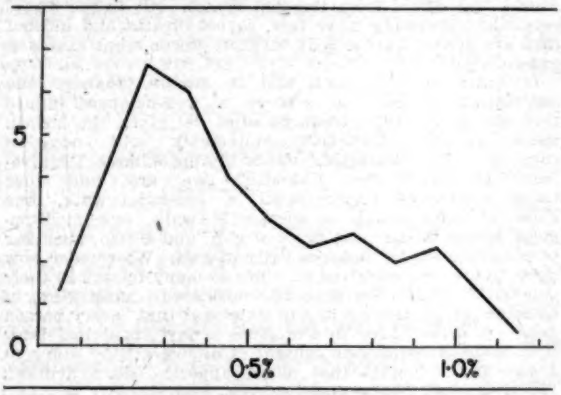

FIGURE V.
Frequency distribution of sizes of spleens of 36 uninoculated bandicoots, expressed as percentages of body weight. The curve is smoothed by the use of a moving average over three ranges.

Table IX shows that the spleens of three of the bandicoots whose sera agglutinated "Q" Rickettsiæ were normal in size. This suggests that their infection with "Q" fever was not immediately previous to examination.

TABLE IX.
Size of Spleens of Bandicoots Reacting to Agglutination Tests with "Q" Fever Rickettsiæ.

Serial Number of Bandicoot.	Sex.	Body Weight. (Grammes.)	Spleen Weight. (Grammes.)	Percentage of Body Weight.
2	M.	2,258	11·6	0·51
17[1]	F.		8·1	
24	M.	1,580	4·5	0·28
25	M.	1,890	5·0	0·26

[1] The weight of bandicoot 17 was not recorded.

Summary.

The bandicoot *Isoodon torosus* Ramsay is susceptible to "Q" fever. Nine bandicoots were inoculated, and at least five became infected, as shown by the recovery of "Q" virus from the organs by guinea-pig inoculation.

Infection is of the inapparent form. The only abnormality found *post mortem* was enlargement of the spleen. Infected bandicoots had a spleen size of from 0·61% to 1·10% of the body weight. The average size of the spleens of captured bandicoots was 0·51% of the body weight.

Inoculated bandicoots developed serum agglutinins against "Q" Rickettsiæ.

Of 44 uninoculated bandicoots tested for "Q" agglutination, four reacted. These had, therefore, been infected with "Q" fever in the bush. They show that the bandicoot is involved in the natural cycle of "Q" fever.

Bandicoot sera which react to agglutination tests are also capable of protecting mice and guinea-pigs against infection with "Q" fever.

The organs of 29 bandicoots were inoculated into guinea-pigs, but the infecting agent of "Q" fever was not obtained.

Bandicoots carry a variety of ectoparasites: lice, fleas, ticks and mites. A large series of these have been inoculated into guinea-pigs, without result.

Acknowledgements.

Our thanks are due to the Honourable E. M. Hanlon, Minister for Health and Home Affairs, Queensland, under whose ægis the "Q" fever investigations are being carried on; to Sir Raphael Cilento, Director-General of Health and Medical Services, Queensland, for permission to publish this article; to Dr. F. M. Burnet, of Melbourne, for his continued cooperation; to Mr. H. Womersley, entomologist, South Australian Museum, Adelaide, for identification of parasites; to Mr. H. A. Longman, Director, Queensland Museum, Brisbane, and Mr. E. Le G. Troughton, curator of mammals, Australian Museum, Sydney, for assistance in the identification of bandicoots; and to Mr. W. Sanderson, Government photographer, Queensland, for the photographs.

References.

(1) A. S. Le Souef, H. Burrell, and E. Le G. Troughton: "The Wild Animals of Australasia", 1926, page 297.
(2) F. M. Burnet and M. Freeman: "The Rickettsia of 'Q' Fever: Further Experimental Studies", THE MEDICAL JOURNAL OF AUSTRALIA, February 12, 1938, page 296.

Reviews.

PHARMACOLOGY AND THERAPEUTICS.

THE firm of Bayer Pharma, Limited, has issued a volume of essays on the chemical aspects of medicine and kindred topics.[1] The book makes interesting reading, but is occasionally marred by wearisome verbosity. If the opinions expressed about Bayer's own preparations are unduly sanguine, there is on the whole a welcome temperance and restraint in the display of scientific enthusiasms. The illustrations and diagrams are particularly fine.

[1] "Medicine in its Chemical Aspects: Reports from the Medico-Chemical Research Laboratories of the I. G. Farbenindustrie Aktiengesellschaft; Volume III; 1938. Leverkusen: Bayer Pharma Limited. Medium 8vo, pp. 416.

At the beginning there is an excellent account of the chemotherapeutics of infectious diseases of protozoal and bacterial origin. It is pertinently stated that advances in chemotherapeutics, as in pharmacology and physiology generally, occur as the result of appropriate animal experiments which render systematic laboratory work possible. Amongst the various preparations considered are "Bayer 205", "Tryparsamide", "Atebrin", "Plasmoquine", "Yatren", "Trypan Blue" and "Trypaflavine". Concerning "Prontosil" it is stated that its action extends not only to streptococci, but also to staphylococci. This opinion is not generally accepted. A new urea compound, "Acaprin", is described. It belongs to the quinoline series and is stated to be eighty times more active in *Babesia canis* infection than "Trypaflavine". It is asserted that cures can be obtained with certainty in both the acute and chronic stages of canine piroplasmosis. Again, it is claimed that the activity of "Acaprin" against the species of *Theileria*, which almost invariably cause death otherwise, is such that cure results, in the vast majority of cases, after one or two injections. *Bartonellæ* are microorganisms whose parasitic nature has been established. They have long been known as inclusion bodies in the erythrocytes in human Oroya fever and in *verruca Peruviana*. These are two stages of an infectious disease incident in Peru. Another species occurs in rats. The spleen is protective against these organisms. "Neosalvarsan" cures these infections even in splenectomized animals, but combined arsenic and antimony preparations are specially active.

In the section dealing with the acridine compounds it is stated that an exhaustive search was made for chemotherapeutic agents in the 9-amino-acridine series. Pharmacologists were particularly interested in ascertaining whether the efficiency of acridine dye-stuffs would be augmented by combination with silver. A complex body formed by the reaction of "Trypaflavine Lactate" with silver lactate has been termed "Argoflavine". This has been given intravenously for such conditions as puerperal sepsis and subacute bacterial endocarditis. Vitamins receive some consideration. Vitamin *H*, the "skin effective" vitamin, was first termed the anti-pellagra factor. It is insisted that the mere absence of vitamin *H* is not sufficient to cause *H* disease. The influence of a toxic factor is of far greater importance. This toxic factor has not yet been isolated. No mention is made in this work of nicotinic acid and its action in effecting a cure of pellagra. Although a masterly account is given of the constituents of yeast and its scientific and industrial uses, nicotinic acid is not mentioned as a constituent; so probably it does not exist in yeast. One of the most entertaining essays is that one dealing with the chemistry of plant-protection preparations, past, present and future. It contains much ancient lore which evidences the lively and vivid imagination of our ancestors. With the slight limitations already mentioned this is a remarkable volume filled with scientific facts.

ANATOMY FOR MASSAGE STUDENTS.

THE appearance of a fourth edition in the eighteenth year of its existence indicates that Ewart's work, "A Guide to Anatomy", satisfies a demand from the students of medical gymnastics, massage and medical electricity, for whom it is designed.[1] The book is divided into sections on a partly systematic and partly regional basis. In the first section, after a brief discussion of the structure and classification of bones, the nature of cartilage *et cetera*, Ewart describes the chief bones or groups of bones in considerable detail and enumerates their muscle attachments. The remaining sections deal with the trunk, head and neck, upper limb and lower limb, in that order, each under the subheadings of joints, muscles, nerves, blood vessels, lymphatics and surface markings. This portion of the book is preceded by a short account of joints, muscles, nerves *et cetera*, in general. The whole plan is well conceived and faithfully pursued, the result being that a considerable amount of information is delivered within a very small compass. An appendix reproduces some examination papers on anatomy and physiology set by the Chartered Society of Massage and Medical Gymnastics. There is a useful index.

The book is liberally illustrated; but some of the figures are rather obscure and a few somewhat crude. Some misprints mar the text, while the limited space employed imposes restrictions on the general discussions. A more serious defect from the point of view of Australian students is the employment throughout of the old terminology; the adoption of the Birmingham "revision" would not entail tremendous labour, and the book so modified would provide a very useful guide for those who, unlike medical students, are not required to master the details of anatomy.

[1] "A Guide to Anatomy for Students of Medical Gymnastics, Massage and Medical Electricity", by E. D. Ewart; Fourth Edition; 1938. London: H. K. Lewis and Company Limited. Demy 8vo, pp. 354, with 102 illustrations, including 39 plates. Price: 12s. 6d. net.

IDEAL WEIGHT.

THE author of "Ideal Weight" states that he possesses a scrap-book which is crammed with details of vaunted anti-obesity cures, which include bath salts, soaps, corsets, vibrators, massage cups, patent breads, pills, powders, capsules and hypodermic injections, all of which are extolled in turn by their supporters.[1] However, according to Dr. Christie, "the keys to a slender figure may be bought, but they cannot unlock the golden gates unless they also include a satisfactory scheme of dieting". Also, in his words, "fat comes from the fuel foods". "It is the direct result of consuming more fats, carbohydrates and alcohol than are needed for the body furnace. Income has exceeded expenditure."

In quite a small book and in simple language the description of how to achieve a well-balanced figure through a properly balanced diet is given in detail. Some of Dr. Christie's statements will occasion surprise. For example, under "Approximate Equivalents of Food and Exercise", we are told that three lumps of sugar equal a one-mile walk, one glass of milk equals a three-mile walk, one medium-sized potato equals nine holes of golf, and a two-ounce bar of chocolate equals eighteen holes of golf. We wonder how these figures were arrived at, since so many factors in their calculation would have to be considered. Any glow of anticipation occasioned by the statement that "every person needs to drink three to five pints a day", is dulled later by a table of the caloric content of almost all the different brews and infusions that might appeal: "short drinks", "long drinks", "home-made drinks" and "factory drinks". A cocktail glass of tomato juice is equivalent to 25 Calories (five if made with saccharine), and a tumblerful of squash to 21 Calories (or five with saccharine), but a liqueur glass of "Benedictine" to 119, a sweet "Manhattan" cocktail to 147, and one and a half ounces of whisky to 82 Calories. A "slow reduction diet" aims at a loss of one to two pounds of fat per week, has a caloric value higher than 1,000, and "can dissipate any amount of surplus fat if maintained over a sufficiently long period". Rapid reduction diets are not considered in this book. To find his ideal weight when he is stripped, the reader is advised to multiply the number of his inches above five feet by five and a half and to the result to add 110.

The second half of the book deals with the nutritive value of foods in common use, and boldly gives the proprietary names and that of the manufacturers, so that one proprietary food may be compared with another. Lest the reader be disheartened by tables of figures, Dr. Christie states that the Calorie system of measuring foodstuffs has many drawbacks. "Nevertheless, it is the only correct method of comparing one food with another. Readers should not be deterred by the mass of figures; it is not necessary to memorize them, but merely to get a general impression of the value of different foods."

This is by far the most attractive book on its subject that we have read. Though so small, it contains a surprisingly large amount of information, and says all that need be said.

[1] "Ideal Weight: A Practical Handbook for Patients", by W. F. Christie, M.D.; 1938. London: William Heinemann (Medical Books) Limited. Crown 8vo, pp. 121. Price: 5s. net.

The Medical Journal of Australia

SATURDAY, JANUARY 28, 1939.

All articles submitted for publication in this journal should be typed with double or treble spacing. Carbon copies should not be sent. Authors are requested to avoid the use of abbreviations and not to underline either words or phrases.

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EDUCATION AND MEDICAL CARE.

IT is almost a platitude to say that modern medicine lays more and more emphasis upon the need for preventive measures and the detection of incipient disease; that it does not aim alone at curing established ailments. As a general rule the community is provided with adequate means, in the form of hospitals, for the quick and expert treatment of acute diseases and of accidents; but, apart from these institutions, we are now witnessing the increasing spread of clinics of one kind and another, which may be regarded as medical detective agencies, as diagnostic bureaux, ready and willing, one might almost say, to stamp out trouble before trouble begins. But in order that clinics, for whatever aspect of preventive medicine they may cater, may do their work to the greatest advantage, those members of the public who avail themselves of such services must be more fully seized of one important fact: that not until many more of our citizens are aware of the benefits that follow a more or less routine survey of their health will preventive medicine come into its own. The public in short must be educated in this matter.

Many people, though the State now offers them medical benefits in an open-handed way that would have seemed extraordinary even twenty years ago, are very unwilling to avail themselves of these boons. There are many reasons for this attitude of mind; we are all glad to assure ourselves, at all times, that however ill our neighbours may become, there is nothing the matter with us—we like to think of ourselves as almost immune to disease. Others of us have no faith in doctors, and comfort ourselves in the belief that no physician, however gifted, can help us. Boiled down, this outlook is but one form of fear, of lack of will, of a secret terror of hearing bad news. Then again, there are those who refuse medical examination on purely economic grounds, giving the excuse that they "cannot afford the time off".

As we have stated, the treatment of many acute surgical affections, exanthems and purely medical diseases of the more urgent type, is now swift and efficient, one reason being that the larger hospitals are ready at all times to provide relief for conditions of a critical kind that admit of no delay. The public is thoroughly aware of all this. But the public must still be made aware that in many places clinics have been established with the object of forestalling chronic diseases. An American writer, Herbert L. Lombard,[1] stresses the need for this new form of education. He points out that even if the economic pattern of modern society was so altered that adequate medical services were available to all, many persons would still be unprovided with proper care, simply because of their complete lack of information on the subject. For the successful running of health services, medical efficiency and the spread of public knowledge are complementary. Though the process of instruction will be a long one, all who are interested in the protection of their physical well-being must be tutored in the need for seeking service at appropriate times. Through neglect or lack of knowledge, chronic illnesses of all kinds continue to make enormous inroads upon the efficiency of most modern populations, producing

[1] *The Journal of the American Medical Association*, November 5, 1938.

long periods of disability amongst thousands of workers, and even a final inability ever to return to industrial life. It may well be that the total eradication of all chronic disease will be forever impossible; but that is no reason why we should not reasonably expect to eradicate at least some of these maladies and to bring about a delay in the ultimate onset of certain others. Figures collected by the Department of Public Health in Massachusetts, and quoted by Lombard in the article to which we have referred, form a useful index to the onset of chronic disease. A group study of about three thousand persons indicated that 20% between the ages of forty and fifty years were in some way affected with chronic ill health, and that of these three thousand, nearly nine hundred had not consulted a medical practitioner or visited a clinic during the previous twelve months. Further, for every one person who pleaded economic stringency as the reason for not visiting a doctor, some seven or eight gave reasons that clearly showed the need for more enlightenment. The significance of these figures can be imagined if we picture how, by proper educative measures, it might be possible to stave off the onset of many chronic diseases until the average age of sixty years. Such a twenty-year increase in the health span would mean a tremendous increase in the national income, greatly increased working efficiency, and fewer doctor's bills. The education of the public in this regard should not be difficult. It may be achieved through the Press, if every section of the Press will refuse to advertise useless and expensive quack medicines; it may be achieved by means of broadcasting, if all broadcasting stations will refuse to accept large fees from ignorant rogues and charlatans, who, if they had their just deserts, would never be allowed to express their views in public.

Current Comment.

DUODENAL DIVERTICULA.

IN 1926 E. I. Spriggs and O. A. Marxer, in an article on duodenal diverticula, recorded the finding of this supposedly rare condition thirty-eight times in one thousand consecutive X ray examinations. True diverticula must be carefully distinguished from false diverticula. In the latter there are hernial protrusions of the mucous and submucous coats through the muscular wall, while in the former all the coats are implicated. Diverticula pass from the duodenum in different directions. As a rule they are situated on that part of the organ which is contiguous to the pancreas and frequently they are found near the termination of the bile duct. Cunningham's "Text-Book of Anatomy" informs us that some of the diverticula are apparently caused by pressure from the interior of the duodenum, but that the majority of the true variety are congenital and possibly associated with the diverticula from which the pancreas and liver are developed. The symptomatology of these conditions is vague. There may be no manifestations at all or merely a dull feeling of heaviness in the epigastrium after meals. Postural methods have been employed to empty the pouches.

D. Wheeler has made a thorough investigation of these diverticula and finds that much confusion as to their classification still exists.[1] Primary diverticula he considers to be those which occur without any obvious cause. The wall of the diverticulum is formed by the mucosal and submucosal coats. Such diverticula are false and may be congenital or acquired. Secondary or true diverticula are acquired and have an obvious cause. They are found in the first part of the duodenum, and all the intestinal coats participate in the formation of their walls. It is exceedingly difficult to ascertain their frequency. Widely divergent estimates are given by different investigators. Wheeler has made an analysis of a series of 2,000 consecutive barium meals investigated by himself and J. C. McMillan. There were 142 cases (7·1%) in which diverticula were reported. Only diverticula of the primary class were considered, that is to say, those arising from the second, third and fourth parts of the duodenum. No instance of secondary diverticulum or pouching of the duodenal loop (the result of stenosis following an ulcer) was included. No primary diverticulum of the first part of the duodenum was noted. In the group of primary diverticula arising from the duodenal loop were some of all sizes ranging from the very small to the very large. The great majority arise from the second part of the duodenum and appear to be adjacent to Vater's ampulla. Care was taken not to include dilatations of the ampulla as diverticula—a differentiation sometimes fraught with difficulty.

Secondary diverticula are the result of scarring and contraction due to an ulcer, with pouch formation, the pouch being the diverticulum. Obstruction of the duodenal cap following scarring causes stenosis. When the obstruction is sufficiently

[1] *The Canadian Medical Association Journal*, September, 1938.

severe, the proximal part of the cap dilates. Such diverticula have all the bowel coats in their walls and are not mere protrusions of the mucous and submucous coats through the muscular wall. Those resulting from such underlying conditions as ulcer give rise to no manifestations. Wheeler remarks that primary diverticula are often multiple and are found on the inside of the duodenal loop in relationship with the head of the pancreas. They are generally observed as goblet-shaped protrusions of the mucous membrane, communicating by a narrow neck with the duodenal lumen. Their size varies from that of a small pea to that of a walnut. They occur most often in the second part of the duodenum in the vicinity of the ampulla. Always on the inside of the duodenal loop, they may lie in front of the pancreas or behind it or within its substance. In Wheeler's series the average age of the patients was 48 years, the youngest patient being 23 years old.

Wheeler states that in the past most workers have considered that primary diverticula are acquired pouches, found chiefly in elderly persons. Mechanical factors, such as pulsion and traction, were assigned as causal agents. Any increase in intraduodenal pressure might be held responsible for their presence. Perry and Shaw have asserted that the pressure in the duodenum is normally greater than that in the jejunum or ileum owing to the prevention of reflux by the pylorus. Wheeler, however, maintains that this cannot be a factor, since diverticula are not associated with protracted cases of chronic obstruction in the small bowel. A weak spot in the bowel wall could be held responsible for herniation of the mucosal coats. Klebs suggested that there was a relationship between these diverticula and the points of entrance of the arteries and the exits of the veins of the bowel wall. Subsequently Hansemann and Fischer stated that mucosal herniæ followed the path of the perivenous connective tissue sheath. Further, it has been maintained by others that portal venous stasis produces distension of the duodenal veins. With a diminution of this stasis potential spaces remain in the bowel and through them herniation may occur. The presence of diverticula on the inside of the duodenal loop has been assigned to the fact that arteries enter the duodenum on that side. Traction of an atrophic pancreas has been suggested as the cause of diverticulosis, but in the most marked cases of pancreatic atrophy no pouches have been found. Diverticula may occur when the pancreas is normal, and it should be remembered that the pouches are invariably separated by loose tissue from the pancreas. A congenital origin for these pouches is now becoming more generally accepted. The diverticula are often multiple, and they are frequently associated with similar abnormalities in other parts of the gastro-intestinal canal. One significant observation is that they have been seen in the first part of the duodenum in young children and infants. After the pancreatic and hepatic outgrowths have been given off, the duodenal epithelium proliferates so rapidly that the mucous lining of the bowel is occupied by a series of vacuoles. It has been suggested, but not universally accepted, that some of these vacuoles produce bulging of the surrounding mesenchyme. The various hypotheses advanced are all interesting, but none of them is conclusive. We are still seeking an adequate and all-embracing explanation for these anomalies of duodenal structure.

ŒSOPHAGITIS IN INFANCY.

THE average pædiatric text-book fails to offer any detailed description of œsophagitis occurring during infancy, and the clinical syndrome associated with this disturbance is rarely mentioned in pædiatric literature. J. H. Ebbs, pathologist to the Birmingham Children's Hospital, has recently reviewed this subject of œsophagitis in infancy and has discussed both the pathological and the clinical features of the disturbance.[1] Examining the hospital records for the past three years, he found that twenty-eight infants under ten months of age had "died with an acute œsophagitis" during that period. The majority were found to have a "thrush" infection of their œsophagus; and two examples of diphtheritic and one of tuberculous œsophagitis were included in the series.

The great majority of these infants experienced a variable degree of discomfort during the act of swallowing, and usually vomited immediately after feeding, the vomitus frequently containing some blood. Occasionally the vomiting was so forceful that hypertrophic pyloric stenosis was suspected. The infants whose œsophagitis was the result of a "thrush" infection had recently suffered from oral "thrush", and Ebbs emphasizes the obvious risk of producing such an infection of the œsophagus by attempting gastric lavage or gavage in an infant who is suffering from oral "thrush". It is recognized that while the usual sites of "thrush" are the margins of the tongue, the inside of the lips and cheeks and the palate, it may involve the whole pharynx and occasionally extend down into the œsophagus or larynx. In the œsophagus the lesion takes the form of a superficial ulceration covered by a soft grey exudate or membrane, which is loosely adherent; histological sections of the wall of the gullet at the site of the infection reveal superficial ulceration covered by an exudate composed of spores, epithelial cells and débris.

From Ebbs's excellent description of this syndrome we may conclude that an infant who has had a "thrush" infection of his mouth, and who tends to refuse his food and vomits soon after swallowing, should be suspected of "thrush" œsophagitis.

[1] *Archives of Disease in Childhood*, September, 1938.

Abstracts from Current Medical Literature.

THERAPEUTICS.

Sulphanilamide.

H. J. GAUDIN, H. A. ZIDE AND G. J. THOMPSON (*The Journal of the American Medical Association*, June 4, 1938) record the results of giving sulphanilamide after transurethral prostatectomy. Patients suffering from prostatic conditions usually have infected urine. Every second patient in the authors' series was given sulphanilamide in doses of from three to four grammes daily. Similar amounts of sodium bicarbonate were given to these patients. Nausea, cyanosis and skin reactions necessitated suspension of the drug in nine cases out of one hundred. After five days the urine was examined. The conclusions reached were that there was no proof that sulphanilamide was helpful in these cases, and considerable evidence that by causing toxic symptoms it delayed convalescence in some instances.

J. D. STEWART, G. M. ROURKE AND J. G. ALLEN (*The Journal of the American Medical Association*, June 4, 1938) discuss the excretion of sulphanilamide. This drug was given to normal subjects every six hours for three to six days, a total of 15 to 25 grammes being given. The urine was studied at the end of the period. All patients became cyanosed, but none were distressed. The sulphanilamide was excreted almost entirely by the kidneys; it was rapidly eliminated; water diuresis increased its excretion. Precipitation of excreted sulphanilamide in urine at room temperature was noted, and suggests the possibility of stone formation in the urinary tract, should urine volume become too small during sulphanilamide therapy.

Vaccination against Tetanus.

A. RAVINA (*La Presse Médicale*, July 20, 1938) discusses vaccination against tetanus. Tetanus occurs without an obvious wound. The injection of ten cubic centimetres of tetanus antiserum is the safest measure of prophylaxis after any wound; however, ten days after this all the effect of the serum has passed, and it is necessary to repeat the injection if any fresh wound has occurred, or if a serious wound has remained unhealed. Every wound is a problem for the medical attendant: should he give tetanus antiserum or not? The problem is complicated by the possibility of serum sickness. Serum prophylaxis has these disadvantages, so that vaccination, with the production of active immunity, would be a great advantage if practicable. Tetanus anatoxin, which is tetanus toxin filtered and treated with formol and heat, has been produced by the Pasteur Institute. It is harmless, effective and lasting. Vaccination with this anatoxin has been carried out in a great number of adults, especially in the army, where it was made compulsory in 1936; and in a large number of infants who were vaccinated against tetanus when they were brought for antidiphtheritic vaccination to the Trousseau hospital. No ill effects have been reported. Immunity was found to be greater than after tetanus antitoxin, and it was much more lasting. After five years it was still present. Similar results were obtained by the use of this anatoxin for army horses. Not one case of tetanus occurred among 35,000 horses which had received three injections of anatoxin. If the antitoxic power of the serum fails, it can be rapidly increased by the administration of a dose or two or three cubic centimetres of anatoxin, instead of the usual antitoxin. Children do not inherit any immunity against tetanus; hence vaccination is necessary from birth. It is suggested that mothers should be vaccinated during pregnancy, so that the infant would be protected from birth. If this is not done children should be vaccinated so soon as they can walk; between sixteen and eighteen months is the usual age. The doses given by the author were 1·0 cubic centimetre, 1·5 cubic centimetres and 1·5 cubic centimetres, each separated by an interval of at least three weeks. Vaccination against tetanus and diphtheria is obtained by three injections of two cubic centimetres of a mixture of tetanus and diphtheria anatoxin. Triple vaccination against tetanus, diphtheria and typhoid fever has also been carried out.

Gout.

F. COSTE, A. GRIGAUT AND M. LAMOTTE (*La Presse Médicale*, July 20, 1938) discuss the synthesis of purines in gouty subjects. It has been shown that uric acid is derived from exogenous and endogenous sources. Even when the diet contains no purines or nucleoproteins, and little protein, and a change is made so that large quantities of protein are ingested, no rise occurs in the excretion of uric acid. There is evidence that purines are synthesized in the body when no protein is ingested. The authors studied the effects on gouty patients of a diet free from nucleoproteins and purines. The diet allowed consisted of milk and eggs, cheese, vegetables, fruit, bread, biscuits, sugar, flour, with very little fat. The therapeutic effect of this diet in thirty gouty patients was very satisfactory. In three patients who had been free from symptoms for many months, a resumption of ordinary full diet, with meat, alcohol *et cetera*, quickly caused a reappearance of symptoms. On this diet the plasma and cellular uric acid content was diminished. The fall of the cellular was greater than that of the plasma uric acid content. Before the diet the plasma uric acid content was 70 to 100 milligrammes per litre; after dieting for one to twenty-four months it was 45 to 60 milligrammes per litre. The cellular uric acid was 40 to 60 before dieting, and 15 to 20 afterwards. On this diet the excretion of urates falls at first, but later rises. The diet usually gave great relief, and often caused complete cessation of attacks of gout. It was well borne and did not cause fatigue or loss of weight. The addition to the diet of vegetable nucleoproteins of a leguminous nature did not cause any symptoms in three cases, but in a fourth gave rise to severe gout. It was probable, though not proven, that the improvement in the condition of gouty patients on this diet was due both to the elimination of nucleoproteins and purines from the diet and to the cessation of alcohol.

Autointoxication.

G. AND R. LEVEN (*La Presse Médicale*, August 20, 1938) discuss the myth of autointoxication in constipation. There is no evidence whatever that substances elaborated in the intestine are absorbed and cause intoxication. Roger has demonstrated that foods, in passing through the intestine, actually diminish in toxicity. The same applies to organisms, which are said to be reduced in numbers in the fæces in constipation. The authors believe the diet of vegetables and fruit usually recommended for constipation is unsuitable. They do not give any vegetables or fruit at first, but allow the patient to go fifteen or more days without any action of the bowel rather than give laxatives or bowel lavage. In exceptional cases, after five or six days, they introduce fluid into the rectum by a short tube, without undue pressure, to soften the stools.

NEUROLOGY AND PSYCHIATRY.

Suicide.

SUICIDE, although a problem of considerable magnitude, has not, according to Sydney Smith (*The Practitioner*, July, 1938) received the attention it deserves. The article presents a review of the ætiology of suicide, and deals at length with conditions predisposing a man to the taking of his own life. While the number of people who are insane when they commit suicide is comparatively small, closer examination frequently reveals the presence of some abnormal mental or intellectual state prior to the commital of the act. The writer regards the better education of the general practitioner in psychological medicine as one of the chief means of prophylaxis. The public also needs to be educated out of its view that to consult a psychiatrist is to run the risk of

having a moral stigma placed upon the patient and his relatives. The author believes that further research into the predisposing causes of suicide is urgently needed.

Excessive Psychomotor Activity Treated by Induced Hypercalcæmia.

T. M. CUTHBERT (*The Lancet*, September 10, 1938) has treated with large doses of calcium lactate and activated ergosterol and with injections of parathyreoid hormone 19 patients suffering variously from mania, agitated melancholia, katatonic excitement and confusional psychosis. The rationale of the treatment was the well-known depressant effect of the calcium ion on nervous and muscular irritability. The pharmacological effect of the treatment was checked by frequent estimations of the calcium content of the blood serum and cerebro-spinal fluid. About 70% of the courses of treatment given were very successful in reducing the psychomotor activity of the patients, and the reduction sometimes persisted for long periods.

Epilepsy.

A. E. LOSCALZO (*The Journal of Nervous and Mental Diseases*, October, 1938) chose fifty cases of so-called "idiopathic" epilepsy, in thirty-two of which the physical and laboratory findings were within normal limits. His investigations concerned the comparative results of two forms of treatment: (i) phenobarbital *plus* a mixture of potassium bromide and chloral hydrate, and (ii) phenobarbital *plus* lævorotatory belladonna alkaloids. No other medication was employed. The experiment was carried out for one year. For the first half-year the patients received phenobarbital with the addition of potassium bromide and chloral hydrate. A total of 8,690 grains was utilized, and 804 epileptic seizures were noted—an average of approximately 25 seizures per patient. For the second half-year the same patients were given a combination of phenobarbital and belladonna alkaloids. A total quantity of 6,690 grains of phenobarbital was consumed, and there occurred only 612 convulsions—an average of 19·1 per patient. It was noted that when the patients were given the phenobarbital combination with belladonna, 23% less of the former drug was required. It is suggested that the therapeutic action of phenobarbital is strengthened by the addition of belladonna.

Mental Attitudes of Tuberculous Patients.

EDWARD A. STRECKER, FRANCIS J. BRACKELAND AND BURGESS GORDON (*Mental Hygiene*, October, 1938) consider that the mental attitude is particularly significant in pulmonary tuberculosis. Long experience with such patients shows that prolonged isolation from family and friends may influence unfavourably the course of the disease. These authors made a complete psychological study of seventy-five tuberculous patients, and drew conclusions from the observations in a further two thousand cases. They were unable to substantiate the common belief that euphoria is an accompaniment of pulmonary tuberculosis. They found that depression and fatalism, anxiety and apprehension constituted the prevailing moods. When elation was noted some other cause than the tuberculosis was demonstrable. The authors were likewise unable to substantiate the general belief that increased sexual desire was a usual accompaniment of pulmonary tuberculosis. Generally such desire was found to be lessened. In those whose desire was increased, other causes for the increase could always be found. Psychological attitudes were as a rule wholly neglected in tuberculosis sanatoria, although the patients themselves were aware of such recognition as likely to play a major role in their recovery. The tendency of patients to talk about themselves and to discuss their illness was a distressing factor, and one that often militated against recovery. Patients' knowledge of their own pathological condition is often startling. Malingering may be a prominent feature in some institutions. This may be attributed to the patients' reluctance to leave comfortable surroundings for poverty-stricken homes.

The Treatment of Anxiety States.

R. D. GILLESPIE (*The Practitioner*, July, 1938) claims that psychoneurotic anxiety must be differentiated from (*a*) depression of the psychotic or constitutional type, which may be accompanied by anxiety; (*b*) those somewhat rare instances in which a severe organic disease may be the proximate cause of the anxiety; and (*c*) some schizophrenic psychoses, which are heralded by anxiety symptoms. Psychoneurotic anxiety is produced by mental conflict. The origin of such conflict may lie in remote faults in emotional development. Conflict occurs when instinctive urges are, through circumstances or upbringing, prevented from finding satisfaction. A state of inner mental tension is produced which may be felt in the mental sphere as uneasiness, and in the bodily sphere as a visceral disturbance. The mental uneasiness and its visceral reverberations are the symptoms which the patient presents. The process of eliciting a psychological history is often synonymous with treatment. There are three reasons for this: (*a*) the confiding of one's personal history and feelings affords relief which in itself alleviates the symptoms; (*b*) the eliciting of personal feelings and historical facts often presents the illness in a new light to the patient; and (*c*) the illumination which dawns upon the patient when the psychotherapist is able to piece together the symptoms and the psychological disturbance preceding them is of great therapeutic value. Suggestion must of necessity play a part in every form of psychotherapy. The practitioner's prestige is in itself a valuable weapon. Suggestion is more applicable to patients who lack intelligence. Reassurance is thrice welcome to those who suffer from anxiety neurosis, particularly if this is supported by an extensive and painstaking examination. While feelings of guilt play a large part in the ætiology of anxiety, confession will form a valuable adjunct to treatment. Historical illumination consists in giving the patient a fresh viewpoint on his symptoms; and, provided there are no deep conflicts, this method often serves to cure the anxiety state. Mental analysis of some kind enters into every form of psychotherapy and forms a very material aid in the elucidation of conflicts. Psychoanalysis is reserved for cases in which the conflict is buried deep in infantile maladjustments and will not yield to the older and simpler forms of established psychotherapy.

Psychosomatic Relationships in Pruriginous Lesions.

HAROLD KELMAN AND HANS FIELD (*The Journal of Nervous and Mental Diseases*, November, 1938) give the life history from a psychiatric viewpoint of a patient suffering from generalized eczema. The psychogenesis of skin lesions is discussed. There is no psychogenic skin lesion *sui generis*; but pathological cutaneous phenomena are conditioned by the psychical state, and the course and curability of such lesions depend more or less directly upon the psychological state of the patient. The case presented in this paper serves to show that there is a close connexion between cutaneous affections and mental and emotional irritation. The subject of the investigation was a twenty-nine year old truck driver with emotional inadequacies and family ties which fostered a strong feeling of inferiority, so that in later years he was unable to cope with the implied responsibility of marriage and parenthood. Practically throughout his married life he suffered from premature ejaculations. The patient was treated many times in hospital. His skin lesions would heal only to break out again every time he attempted to shoulder the burden which he found so difficult. Once his wife separated from him, the recurrences of his skin lesion became mild and infrequent and he was enabled to resume work. As time went on, the lesions lost their specific connotation and mild recurrences would come about as the result of any kind of mental upset. The patient's skin had become an organ of emotional expression. Other cases are quoted in order to elucidate the psychodynamics of this particular case, which shows that, in a broad sense, no disease can be considered apart from the patient who suffers from it.

British Medical Association News.

SCIENTIFIC.

A MEETING of the Victorian Branch of the British Medical Association was held on October 19, 1938, in the Anatomy Department at the University of Melbourne. The meeting took the form of a series of anatomical and pathological demonstrations by members of the staffs of the departments of anatomy and pathology.

Pathological Demonstrations.

PROFESSOR P. MACCALLUM showed specimens to illustrate types of aneurysms. Syphilitic aneurysms were shown with various late complications, such as erosion of vertebræ, of the sternum into the trachea, and erosion of the duodenum. There were two specimens in which a completely canalized clot was present. Non-syphilitic aneurysms were also shown, and several examples of dissecting aneurysms of the aorta.

DR. C. H. MOLLISON demonstrated from a number of specimens illustrating various points of medico-legal interest: (*a*) bones showing how, when all the soft tissues had been destroyed, the presence of shot would indicate the cause of death; (*b*) bullet wounds of the skull, showing the difference between those of entrance and those of exit; (*c*) fractures of the skull, showing the linear fractures from a fall on a hard flat surface, and the comminuted depressed fractures caused by a blow or other form of localized violence; (*d*) specimens of tattooing and dental work determining identity in otherwise unrecognizable remains; (*e*) ax wounds of bones caused by the cutting up of a body after a murder by an ax wound of the head; (*f*) small pieces of bone from a calcined body, sufficiently distinctive to determine their human origin; (*g*) bones of small animals that had been sent for examination in the belief that they were the bones of children; and (*h*) bones of a fully mature infant, which had been recovered from a well and were mixed with rabbit bones.

DR. ERIC L. COOPER showed some treasures from Sir Harry Allens' museum.

DR. JOHN HORAN demonstrated specimens and sections of pathological conditions of the stomach.

DR. L. E. ROTHSTADT showed a series of specimens and slides illustrating various aspects of the pathology of the thyreoid gland. Thyreoid glands removed from patients suffering from exophthalmic goitre were shown and the influence of Lugol's solution was visible; in some of the glands the iodine had produced scattered colloid changes, while other glands were unaffected and remained uniformly opaque. Several nodular goitres were shown, and the complications of cystic change, hæmorrhage, calcification and malignant disease were seen in the various specimens. A thyreoid gland with malignant change, which had invaded the trachea, was shown, together with metastases in lymph glands and lungs. Other specimens included were of Riedel's disease, true adenoma and myxœdema.

DR. T. E. LOWE showed specimens illustrating pathological conditions seen in association with coronary thrombosis. Syphilis of the aorta and atheroma of the aorta were shown as possible causes of the blocking of the entrance to a coronary artery. A photomicrograph of the typical appearance of a branch of a coronary vessel in that condition was demonstrated. Specimens of ruptured ventricles, aneurysms of ventricle, scars in the ventricular wall, and mural clots, were shown to illustrate the results of coronary infarction.

DR. N. M. HARRY showed a series of microscopic specimens of thyreoid gland from patients with Riedel's disease and lymphadenoid goitre. In a patient with Riedel's disease he demonstrated that most of the epithelium had undergone metaplasia to a stratified squamous type. Other sections illustrated the similarity between the histological pictures of Riedel's thyreoiditis and tuberculosis. In two specimens proliferating thyreoid cells in fibrous tissue closely resembled malignant neoplasia. Several slides of typical lymphadenoid goitre were compared with those taken from examples of toxic goitres in which scattered areas of lymphoid tissue replaced the thyreoid vesicles.

DR. J. B. SOMERSET showed a series of macroscopic and microscopic specimens of tumours of the kidney and testis.

DR. T. G. SWINBURNE arranged a demonstration of sialograms showing pathological changes, contrasting them with normal sialograms, and showed microscopic preparations of metaplasia in the mouth cavity. He also showed photographs of the condition known as hairy tongue, and also some microscopic slides of specimens of that condition.

DR. J. F. HUGHES showed the salient features of a case of generalized *osteitis fibrosa cystica*. The patient's condition had been undiagnosed until after several reinvestigations. A parathyreoid adenoma was removed at operation and the patient had been cured. Comparison of the preoperative radiograms with those taken four months after operation showed a most striking improvement in the general condition of the bones, particularly in those of the skull. A section of the parathyreoid adenoma was shown under a microscope. Dr. Hughes also demonstrated from a specimen of unilateral fusion of the kidney—one of the rarest types of congenital renal abnormalities. The vascular and ureteric connexions were shown clearly in the dissected specimen, and the clinical features of the condition were discussed and illustrated by a description of the clinical features of an actual case. A series of hearts was displayed, showing a number of abnormalities of origin of the coronary arteries, including the presence of supernumerary coronary vessels. In one heart shown the blood supply came from a single coronary artery. Some of the hearts had been injected to demonstrate various features of the coronary vasculature.

Anatomical Demonstrations.

DR. A. E. COATES demonstrated from a number of specimens prepared to illustrate many aspects of neurological anatomy.

DR. E. GRAEME ROBERTSON showed a series of skiagrams to illustrate the advantages in diagnosis that could be obtained by means of ventriculography. He also showed the radiographic appearances of various intracranial conditions.

DR. RUSSELL HOWARD demonstrated from a dissection the anatomy of the lung root, and DR. KENNETH RUSSELL that of the bronchial tree. DR. JOHN O'SULLIVAN correlated those demonstrations with the radiological anatomy by means of a number of skiagrams.

ACTING PROFESSOR E. A. ROWLANDS demonstrated the anatomy of the stomach, DR. PAUL JONES that of the biliary tract, and DR. JOHN TURNER that of the rectum.

DR. E. HARRISON and DR. BRYAN KEON-COHEN showed a series of dissected specimens to illustrate various orthopædic problems and the rationale of appropriate treatment.

DR. T. G. SWINBURNE demonstrated the anatomy of the nasal accessory sinuses.

DR. FRANK HAYDEN demonstrated the anatomy of the female pelvis, with special bearing on the solution of gynæcological problems.

DR. K. BOTTOMLEY and DR. K. O'DAY arranged a comprehensive histological demonstration.

NOMINATIONS AND ELECTIONS.

THE undermentioned have applied for election as members of the South Australian Branch of the British Medical Association:

Cherry, Edward Percival, M.B., B.S., 1938 (Univ. Adelaide), Adelaide Hospital.

Magarey, James Rupert, M.B., B.S., 1938 (Univ. Adelaide), 6, Stephen Terrace, Gilberton.

Salts, Richard John, M.B., B.S., 1935 (Univ. Melbourne), Millicent.

Walker, Joseph, L.R.C.P. and S., 1926 (Edinburgh), F.R.F.P. and S., 1926 (Glasgow), Karoonda.
Jolly, Bertram Morris, M.B., B.S., 1937 (Univ. Adelaide), Streaky Bay.
Game, John Aylward, M.B., B.S., 1938 (Univ. Adelaide), Adelaide Hospital.
Yeatman, John Charleton, M.B., B.S., 1938 (Univ. Adelaide), 188, Cross Roads, Malvern.
Angove, Roger Clare, M.B., B.S., 1938 (Univ. Adelaide), Adelaide Hospital.
Newland, Malcolm Creswell, M.B., B.S., 1938 (Univ. Adelaide), Adelaide Hospital.

The undermentioned have applied for election as members of the New South Wales Branch of the British Medical Association:

Rosen, Eric Nathan, M.B., B.S., 1931 (Univ. Sydney), 22, Walker Avenue, Haberfield.
Connolly, Edward Philemon, M.B., B.S., 1930 (Univ. Sydney), 63, Fairlight Street, Manly.
Cumpston, Alan George, M.B., B.S., 1938 (Univ. Sydney), Sydney Hospital.
O'Toole, Cyril Paul, L.L.M., 1927 (R.C.P.I.), L.L.M., 1927 (R.C.S.I.), Bulahdelah.

Medical Societies.

MELBOURNE PÆDIATRIC SOCIETY.

A MEETING of the Melbourne Pædiatric Society was held at the Children's Hospital, Carlton, on September 14, 1938, DR. COLIN MACDONALD, the President, in the chair. Part of the meeting took the form of a series of clinical demonstrations by members of the society. A report of this section of the meeting will be published in a subsequent issue.

Vitamin C in Relation to Diseases of Children.

DR. STANLEY WILLIAMS read a paper entitled "Vitamin *C* in Relation to Diseases of Children" (see page 145).

DR. J. W. GRIEVE said that he agreed with the summary of the situation presented by Dr. Williams. From the standpoint of the treatment of scurvy, Dr. Grieve considered that the administration of orange juice was the most effective method. One patient treated with synthetic vitamin *C* had died from an intercurrent infection. This might not have happened if the patient had been given orange juice.

DR. IAN WOOD said that the absorptive factor presented a difficulty. He wondered what storage of vitamin *C* there was in the body, and how long the store would last if not replenished.

DR. J. B. COLQUHOUN said that, in contrast with his experience in the northern hemisphere, he saw very little of the late results of scurvy. He considered that the general public in Australia were very well catered for with regard to feeding. If they took the matter up they would soon have quite a campaign for the prevention of deficiency diseases.

DR. H. DOUGLAS STEPHENS said that Australia was surpassed in the purity of its food by one other country only, and fresh air was readily available. If the diet of the women was so deplorable as Dr. Collins had indicated in his remarks on a case of scleroderma discussed in the first part of the meeting. Dr. Stephens could not help wondering why more deficiency disease was not evident.

DR. V. L. COLLINS said that he felt sure that Dr. Stephens was referring to the relative rarity of gross deficiency diseases; but it had been Dr. Collins's object to draw attention to the slowly acting slight deficiencies which were predisposing factors in disease and, if uncorrected, delayed recovery from sickness.

DR. MONA BLANCHE said that much care was devoted to dietary in the antenatal clinics at the Queen Victoria Hospital and the Women's Hospital. She felt that many of the pregnant women knew what they should eat, but were not always able to afford it all. The workers at the baby health centres had always been keen on recommending the addition of adequate amounts of fresh orange juice to the dietary of infants, and it could reasonably be claimed for them that that policy had made scurvy scarce.

DR. A. P. DERHAM said that in spite of Dr. Stephens's remarks it was unquestionable that all the children did not get proper nourishment. He instanced the difficulty in the procuring of sufficient suitable food for the children of parents in receipt of sustenance, of war pensioners, and of those in receipt of the basic wage. He had investigated the feeding of approximately 5,000 children, the families of returned soldiers, and had formed the impression that either because of poverty or ignorance the dietary was frequently inadequate. The two great faults were an under-supply of first-class protein and of vitamin *B*. By inducing the people to give the children more meat, milk, eggs and vitamin *B* he had found that they were able to gain weight satisfactorily when under the expected weight for age, height and body build.

Dr. Williams, in reply, said that the absorptive factor mentioned by Dr. Wood was still a source of worry to him, and that he would like to have the opportunity of investigating it properly. He would also like to pursue research into the effect of the intravenous injection of vitamin *C* and into the alterations in the blood chemistry. He had noted a reference to the members of a Norwegian fishing fleet who had shown signs of scurvy after receiving for three months a diet deficient in vitamin *C*.

Proceedings of the Royal Commission Appointed to Inquire into Matters Pertaining to National Health Insurance.

EVIDENCE SUBMITTED BY DR. D. M. EMBELTON.

THE following is an abstract of the evidence submitted by Dr. D. M. Embelton before the Royal Commission on December 4 and 5, 1938, at Sydney. The abstract has been prepared by Dr. Embelton at our request.

The evidence is related to reference I and reference VI. It was submitted in the form of a memorandum for each reference and appendices related thereto. Evidence was given regarding reference VI at the request of the Victorian Branch of the British Medical Association, with the approval of the Federal National Insurance Committee; but the substance of the proposals contained in the evidence was not to be regarded as necessarily in accordance with their view.

REFERENCE I.

The object of the inquiry under reference I of the terms of reference of the Royal Commission is to determine the annual amount to be paid per insured person entitled to medical service, having regard to: (*a*) the scope of service, (*b*) terms and conditions of existing contract practice in Australia, (*c*) other relevant conditions.

The financial terms of contract practice in Australia are

based on a concessional service compensated for by private practice. The evidence submitted by the medical witnesses before the Commission has sought to establish what would compensate for the loss of private practice under a further extension of contract practice. With a wide and uncertain extension of contract practice the compensatory method is unstable.

In this memorandum it is sought to establish the capitation fee as fair and adequate payment for service rendered, having regard to: (i) the transference of remunerative services, outside the scope, from the general practitioner to public hospitals and specialists; (ii) the health of the insured persons; (iii) solvency of sickness benefit funds, for which purpose the medical benefit is included within the *National Health and Pensions Insurance Act*, 1938; (iv) the prevention of loss of working days to industry; (v) increased demand for medical care under national health insurance.

The computation of the capitation fee is based on the Federal Arbitrator's award, number 23, 1926, relating to medical officers appointed to the Commonwealth Health Department, having regard to working hours and strict limitation of lists.

1. Family Physician Service.

Family physician service cannot be supplied at friendly society rates. Lodge basis is not the basis of private practice. Analysis of my own practice shows that friendly society work is a concessional service.

Evidence and confidential exhibits showed a net return per lodge service of 5s. 2d., or £1 12s. 10d. per working week of forty-eight hours at lodge rates paid in Victoria (£1 *per annum* per family).

At present, the concessional service is paid for indirectly by the introduction of the practitioner to: (a) surgery (major and minor) and obstetrics, (b) private patients among relatives and friends of the friendly society member.

Regarding (a), experience has taught and is still teaching the profession to redistribute the medical and surgical work more and more, in the interests of efficiency, and the demand of the public conforms to this redistribution. Neglecting surgical practice altogether, the family physician still has a very wide field to cover.

Appendix VII, submitted with the evidence, shows that in Victoria, for the period of ten years from 1927 to 1937, the in-patients treated in special hospitals increased by 54%, and the out-patients by 52%; at the metropolitan general hospitals the in-patients increased by 34% and the out-patients by 81%; and in the country general hospitals the in-patients increased by 87% and the out-patients by 206%. (See "Report of Charities Board of Victoria", 1937, page 27.) This shows the increased reliance placed by the people on the public hospitals for services outside the scope of friendly society contracts. It is estimated that in Melbourne 60% of the public at present rely on public hospitals for specialist medical and surgical care (Appendix I).

Having regard to these facts, it also seems undesirable that provision for special services (for example, anæsthetics and fractures) should be made in the amount recommended in the capitation fee, under reference I. The cost of X rays for fractures, nursing and surgical aid, for which the anæsthetic would be given, is in practice provided by the public hospital for the main body of those coming under the national insurance scheme, and so must also the related anæsthetic and subsequent treatment of the fractures. Those persons who can provide for X rays, surgery and nursing will not find any great economic strain in paying for an anæsthetic also.

Regarding (b), hitherto the field of private practice for family physician service has ranged over four and a half million people. With the introduction of compulsory and voluntary national insurance that field will, I believe, be reduced to about one-third (1,500,000) if adequate provision is made under reference VI (voluntary insurance for dependants). Since there is a residential segregation of employed people in what are called "industrial" suburbs, and employed on their own account in "residential" suburbs, the remaining private practice I expect to be very small in "industrial" suburbs, and little will remain to support a concessional service in industrial suburbs.

Appendix VI shows that of 1,705 private patients (individuals) seen in three years at Essendon, Victoria, there were 569 employed persons (prospective insured), 54 aged men (prospective insured), 890 women and children, 192 unemployed, employed on own account, coming under workers' compensation, over the wage limit and not accounted for. Facts herewith submitted relating to my own practice seem to support this contention (Appendix VI).

Three-quarters of the private practice will be lost in the community as a whole, and nearly all of the private practice in industrial suburbs (two-thirds of Melbourne). Thus it is seen by (i) transfer to hospitals and specialists of service outside the scope of friendly society and national insurance contracts by redistribution of service, (ii) loss of private practice as a result of extension of contract practice, that future agreements for contract service cannot be made at concessional rates. The basis of future contracts should be adequate direct payment for work done. The family physician in industrial suburbs—600,000 people, or two-thirds of Melbourne—must rely on capitation fees as the sole remuneration.

2. Health of the People.

Development of a high quality family physician service is desirable in the interests of the health of the people, so that not a life will be lost or avoidable suffering incurred for lack of proper medical care. The aim of the National Insurance Bill was to maintain willing and contented medical service not inferior to ordinary private practice. (Honourable R. G. Casey, second reading speech.)

English Experience.

Although the school children are healthier and epidemics are less, and national insurance medical benefit has been functioning, there has been a steady rise in the volume of sickness and disablement in the last fifteen years. This is borne out by a view of sickness and disablement benefit experience in two periods: (a) in 1921-1927 (England), (b) in 1931-1936 (Scotland).

The former period, 1921-1927, demonstrates a large increase in claims, particularly for illnesses of shorter duration, up to two weeks, among married women and younger persons under forty-five years of age. Among men under forty-five years certified illnesses, up to two weeks' duration, increased by 88% between 1921 and 1927. (Supplement to *The British Medical Journal*, May 10, 1930, page 213.)

In the period 1931-1936 (Scottish national insurance) the number of persons incapacitated annually was not increased materially. The duration of the incapacity was very much increased. The number of chronically sick patients on the sick list for a year or more increased by one-third.

Of 19,000,000 days of incapacity in 1935-1936 (Scotland) more than 11,000,000 days are attributable to sickness of a year or more in duration. Seventeen persons per 1,000 insured in Scotland are continuously incapacitated for a period of one year or more. (*The British Medical Journal*, July 2, 1938, page 11.) Further reference is made to these periods in the parenthesis at the end of the next section.

3. Solvency of Sickness Benefit Insurance Funds.

The number of insured persons in Scotland is approximately the same as the number to be insured in the Commonwealth. ("Ninth Annual Report of the Ministry of Health for Scotland", Appendix 33.) We may take it that the cases of psychosomatic illness represent one-third of the chronically sick (see note at the end of this section). This creates for the medical profession an opportunity to inquire carefully into the causes of these complaints of the insured, and avoid fixation of the neuroses by (a) positive spot diagnosis of organic disorder, (b) amplification of this by mechanized treatment. A large amount of money would thus be saved to the approved societies annually. The saving by early diagnosis, prevention and treatment of psychosomatic illness alone in Australia

would be in the region of £500,000 a year. This class of patient represented only one-third of those ill for a year or more. Much of the remaining two-thirds of chronic illness is preventible or remediable by an adequate health service. Lay and medical authorities have attributed the increased incidence of certified sickness and claims to several causes, as follows:

(i) The insured persons now have become alive to the benefits to which they are properly entitled under the acts, and as a result mostly claim that to which they are properly entitled.

(ii) Employers of labour, realizing to a greater extent the benefits to which their employees are entitled under the national health insurance acts, urge their employees to claim benefits to which they are entitled, and to which both employers and employees and the State have contributed by way of premiums.

(iii) Under a system of compulsory State insurance the attitude of the individual insured person with regard to obtaining benefit from State funds is entirely different from that of the voluntary member of an old friendly society or similar body; he could apply for benefit from funds which he regards as State provided and practically unlimited, where he would never have claimed from a fund built up entirely from contribution of himself and his fellows.

(iv) Unemployment and antenatal care are also suggested as possible causes.

(v) Lax medical certification was suggested as a cause.

The Insurance Acts Committee of the British Medical Association points out that it is not the standard of medical certification which is lowered, but rather that the legitimate demand for sickness and disablement benefit has increased. Initiative for certification lies not with the doctor, but with the insured person. Patients cannot be held responsible for the estimates of their own incapacity, yet these estimates may have to be taken into consideration where no gross signs of disease are present. This initiative or exercise of right of the insured person has been greater since 1921 in short illnesses and among the younger generation.

The review of Sir Alfred Watson (1921-1927) and Scottish experience (1931-1936) show that the standard of incapacity set by the insured themselves in initiating their claims for benefit in acute illness and establishing their right to a sustained demand for benefit in chronic illness has altered. Careful scrutiny into the reason for the initiation of a claim, early diagnosis, prevention and treatment, demands considerable time from the certifying doctor. Great care is necessary before a doctor can be sure any refusal to certify a person as sick is just. This requires a limitation of panel lists, with a high capitation fee as a corollary. Primarily any government has its choice on which way funds will be spent; but spent the fund will be on medical or sickness benefit. (For this summary of the report by Sir Alfred Watson, Government Actuary, on sickness and disablement experience of a group of approved societies, 1921-1927, see Supplement to *The British Medical Journal*, May 10, 1930, page 213.)

A review of sickness and disablement benefit claims by a sample from approved societies of 219,000 men, 172,000 unmarried women, including widows, and 64,000 married women, between 1921 and 1927, shows that in 1921 the claims were lower and in 1927 higher than the actuarial provision made, especially regarding married women. Between 1921 and 1927:

Claims increased for:	Sickness Benefit.	Disablement Benefit.
Men	41%	65%
Unmarried women	60%	100%
Married women	106%	159%

Number of claimants increased:	Sickness Benefit.	Disablement Benefit.
Men	14% to 23%	1·5% to 2·6%
Unmarried women	—	1·9% to 3·9%
Married women	—	3·3% to 9·2%

In 1927, 420 per 1,000 married women (insured) drew either sickness or disablement benefit or both. Between 1921 and 1927 the duration of claims did not seriously alter: men, four and a half weeks; women (unmarried), six weeks; women (married), seven weeks.

With regard to the second period (1931 to 1936), in 1930 certain details about insured persons in Scotland who became ill and unfit for work began to be collected and analysed. A special register was devoted to those persons who had been on the sick list continuously for more than twelve months. Eighty-six *per centum* of the illnesses were represented under the following headings: peptic ulcer, gastritis, nervous debility, bronchitis, anæmia, rheumatism, cardiac debility, diseases of the circulation, other diseases of the respiratory system, neurasthenia, injuries, insanity, tuberculosis and cerebral hæmorrhage.

The highest percentage increase in nervous debility, bronchitis, anæmia, neurasthenia, injuries, insanity, tuberculosis, cerebral hæmorrhage, was shown in the age group 16-34 years. The highest percentage increase in peptic ulcer, gastritis, rheumatism, cardiac debility and diseases of the circulation was shown in the age group 35-54 years. In no instance was the highest percentage increase in chronic disease found in the age group 55-65 years.

Dr. J. L. Halliday, Regional Medical Officer of the Department of Health for Scotland, reviewed 1,000 cases of insured persons who were sick for a period of more than one year. He had at his disposal the assistance of any consultant and ancillary services desired to diagnose the cause of disease. One-third of these patients were found to be suffering from psychoneurotic or psychosomatic illness, registered as one of the above-mentioned diseases. (*The British Medical Journal*, March 9, 1935, page 85.)

Chronic illness primarily due to physical causes is still relatively more frequent in the old than in the young, while the greatest increase in the incidence of chronic sickness among insured persons was not in the aged, but in the younger age group.

Davies and Wilson show that peptic ulcer and its relapse are related to emotional disturbances. They have collated evidence in regard to 205 cases of peptic ulcer. In 84% of these cases the appearance of the ulcer and its relapse was closely related to emotional disturbances occurring in the life of the individual and causing anxiety.

> The anxiety state is an expression of fear or worry engendered when an individual encounters an unhappy or painful situation in life. The mind flees from it and the flight is accompanied by the bodily symptoms and signs which are an expression of the emotional reaction to fear. When symptoms appear, the individual's attention is drawn away from the painful situation and becomes concentrated on the symptoms which he interprets as evidence of his being ill. He will not get well until he adjusts himself to his worry. Personal relationships, finance and occupation, alone or in combination, and other ordinary social relations, formed the foundation for most of the anxiety states.
>
> Social, financial and occupational difficulties create or accentuate the anxiety state. The physical manifestations of anxiety neurosis are very varied: weariness, tiredness, indigestion, palpitation, giddiness, vomiting, diarrhœa, headache, frequency in passing urine, sleeplessness, and loss of power to concentrate.
>
> Any organ regarded as inferior by the patient is likely to be a site of pain; *e.g.*, war wound or operation scar. At the same time the patient is unconscious of the relationship between his anxiety and his pain or that his illness serves the purpose of escaping his difficulty.

4. The Loss to Industry from Sickness et cetera.

The loss to industry from sickness, loss of wages to employees, loss of purchasing power creating unemployment, are serious considerations.

Reference to the "Ninth Annual Report, Department of Health for Scotland", 1937, Appendix 33, indicates that 266 per 1,000 persons insured obtained a first certificate during the year.

The average number of days of incapacity per insured person was 14·92; the average number of days of incapacity per sick person was 56. For persons sick for the whole year (30,754 in number) the days of sickness amounted to eleven and a quarter million. The loss to industry, families and business is very great.

The close relationship of unemployment and chronic disabling illness is demonstrated in Appendix X, page 4, showing that compared with employed persons it is five times more common among the unemployed. (This appendix is an extract from *The Journal of the American Medical Association*, May 29, 1937, page 1876.)

It was pointed out previously that proper care to psychosomatic patients alone would save about 4,000,000 working days a year to industry, at a conservative estimate, and that represents only one-third of the chronic sickness. We cannot be sure that the Australian sickness experience will be superior to the Scottish.

The "Fifty-Ninth Annual Report of Friendly Societies", issued by the Government Statist, Victoria, relating to the period ending June 30, 1936, indicates the following:

For males:

Sickness per effective member	3·219 weeks.
Per sick member	11·769 weeks.

For females:

Sickness per effective member	2·394 weeks.
Sickness per sick member	10·453 weeks.

This does not seem to be as good as the Scottish experience.

5. Increased Demand for Medical Care under National Health Insurance.

Comparison of the Australian census, 1921 and 1933, shows an increase in the age of the population thus ("Commonwealth Year Book", 1937, page 339):

	Under 15 Years.	15 to 65 Years.	65 Years and Over.
1921	31·71%	63·86%	4·43%
1933	27·55%	65·97%	6·48%

The estimated numbers of persons in the old age pensions group are as follows (Sir Walter Kinnear's report, June 13, 1937, page 23, paragraph 80):

	Men.	Women.	Total.
1937	210,000	380,000	590,000
1957	380,000	620,000	1,000,000
1977	470,000	810,000	1,280,000

The proportion of people with permanent impairments increases with age. Over sixty-five years one person in eight is chronically sick. Chronic disability of some degree affects 20% of the people. About 17% is in people aged under forty-five years, 29% between forty-five and sixty-four years, and 48% is in people over sixty-five years. (*The Journal of the American Medical Association*, May, 1937, page 1876.) Five hundred thousand persons over forty years are coming into insurance. (Second reading speech, Mr. Casey, page 18.)

Under contract service they will seek twice as much service for their chronic illness as they do under private service at present (Appendix IV). The practice in England is for practitioners to send greater numbers of aged patients to the municipal hospitals. (*The British Medical Journal*, May 29, 1937, page 320.)

Appendix IV is an analysis of services (attendances and visits) for lodge and private patients, according to age and sex, during the twelve months 1936-1937. Friendly society members and private males compared in Appendix IV shows that under forty-six years the amount of attention to lodge patients is more than double that to the private patients, and over forty-six years the demand per sick person is three times as much at the surgery for the lodge as for the private patient, and a little more at the home. The incidence of medical attention according to age amongst friendly society members over forty-six years is three times the amount of that given to friendly society members under forty-six years. This indicates the increased demand of: (*a*) the contract patient when compared with the private patient; (*b*) the patient over forty-six years compared with those in the lower age groups. It goes to indicate the increasing demand for medical care which will occur when 500,000 people over forty years become insured and entitled to unlimited services for a fixed payment. This increasing demand caused by the increasing age of the population associated with national insurance concerns not only the Pensions Department, but also the medical profession.

Comparison of the friendly society members with the employed group of people going into insurance leads us to endorse the statement of the National Insurance Commission of Australia, which, on page 9 of its report issued in 1925, states: ". . . it is anticipated that the rate of sickness among insured population under national insurance will be, in the earlier years of the scheme, greater than that of friendly societies".

(i) Because it is impossible to sustain a concessional service when (*a*) remunerative services outside the scope of physician service have been and are being transferred to public hospitals and specialists, (*b*) the private patients have been absorbed into contract practice; (ii) in order to maintain the health of the people by early diagnosis, prevention and treatment of disease; (iii) in order to secure the solvency of funds by controlling as far as possible by careful examination of patients the altered standards of incapacity; (iv) to obviate the increasing loss of working days to industry; (v) to compensate for the increased demand for medical care which will arise under a national system of contract practice paid for by capitation fees and complicated by (*a*) the increasing age of the population, and (*b*) shortage of hospital provision for chronically sick and aged; for these reasons a high capitation fee, with limited panel lists, should be arranged, such as will provide adequate remuneration to enable a family physician to work reasonable hours and to earn an income which will invite capable men to enter and remain in the service.

The number of visits or consultations per day of eight hours payable by the doctor at twenty minutes per consultation or visit equals 25.

Twenty-five to thirty visits and attendances take ten or eleven hours; thirty to thirty-five visits and attendances take a hard day; forty visits and attendances per day cannot be continued. The number of visits and consultations per year per insured person would seem to be a reasonable minimum of 3·5. Allowing 25 visits per day, 313 days per year, 7,825 visits and consultations would be a hard year's work, and these services would be spread among $\frac{7,825}{3·5}$ = 2,236 persons.

Limitation of Lists.

The Victorian Branch Council Insurance Acts Committee resolved that lists in one-man practices be limited to 1,250.

> In each 100 insured persons there are 60 single and 40 married, with 96 dependants (40 wives and 56 children) . . .
>
> A doctor can care for 2,236 people, therefore the number of insured which he can reasonably care for = $\frac{2,236}{196} \times 100 = 1,130$—maximum on list.
>
> During a probationary period, at the inception of insurance, lists of 1,500 might be allowed. To permit of the smooth working of the scheme, steps must be taken, preferably initiated by the medical profession, to develop extra medical services for insured people in those areas where lists of more than 1,500 would seem to be necessary to meet with the medical demand of the insured people. If the scheme for dependent children is admitted, the number allowable on the list should be 1,150-1,250.

Capitation Fee.

A doctor employed full time on insurance practice should be able to make a reasonable livelihood without having

to resort to some outside specialty or service to meet his obligations. The net income is that on which he lives and maintains a desirable standard of culture and suitable companionship for himself and family, free from financial difficulties of a serious nature. Anything less than this will tend to reduce the efficiency and quality of the men who enter the medical profession. It is a matter about which in public interest there can be no question. The greatest contribution the doctor can bring to his patient is one of goodwill. Any system which will create in the medical profession a feeling of oppression engenders antagonism, to the detriment of the patient and the welfare of the community.

There is a great deal of misunderstanding concerning the rate of remuneration of doctors. Gross income is assumed to be net income. Often no consideration is given for the long irregular hours, isolation, necessity to relinquish practice in one place in order to take a year's rest and refresher course before he resumes practice in another, the length of time and capital involved in graduation, and the large house he has to occupy, saleable only to a limited medical clientele.

The family physicians in Melbourne alone provide consulting and waiting rooms and extra accommodation for staff (so that someone is on duty on the doctor's premises 168 hours a week to answer the telephone), to the capital value of £350,000 as a minimum.

The capitation fee should be sufficient to return to the doctor working full time on insurance an annual net remuneration equal on the average to that received by a practitioner employed in the public medical service. The number of people in Victoria divided by the number of family physicians is about 1,800, so that if a family physician attaining full-time physician service treated 2,300 people, his efficiency and popularity are probably establishing his value to the community, and that is the real efficiency bar which he must pass to reach full salary. The salary available for service to a full complement of patients should be the maximum salary. In the Public Medical Service Federal Arbitrator's Determination, Number 23, 1926, the salary, 1926, of £708 to £948 *per annum* is recommended; efficiency bar at £852.

The Federal Public Service medical officer is called upon to work thirty-six and three-quarter hours a week, spread over five days a week. He is allowed public holidays and has no night work, as opposed to the family physician—seven days a week on duty, on call for 168 hours in the week, no clear Saturdays, Sundays or public holidays, and no sick leave. It is assumed that the Federal Arbitrator took into consideration when making the award the cost of medical training, which would be redeemed by a sinking fund of £143 *per annum* over a period of twenty years after graduation.

In view of all these considerations it is proposed to add 33% to the salary. The age at which a family physician must slacken off is much earlier than in the public medical service; for the life is a very much more arduous one. The tendency is to create oppressive conditions for purpose of economy, so that those employed on family physician service seek to escape as early from it as possible, while on the other hand the P.E.P. report indicates that it is the pivot of the national medical machine.

	Public Medical Service.	Family Physician.
	£ s. d.	£ s. d.
Salary Arbitrator:		
Award 1926, Number 23 ..	948 0 0 ..	1,264 0 0
Superannuation at 5½% ..	52 0 0 ..	52 0 0
Long service leave, 6 months in 20 years = 1½ weeks *per annum* ..	23 0 0 ..	23 0 0
Recreation leave, 3 weeks	54 0 0 ..	54 0 0
Net income		£1,393 0 0

Carried forward	£1,393 0 0
Practice: Capital outlay for purchase of goodwill and equipment, not usually allowed in overhead expenses, not being deductible from income tax at 5%. He would otherwise be receiving interest at 5%. Average amount of money involved = £1,250	62 10 0
Overhead expenses must be added. This has got to be paid before he gets any net income. The actual figure will be demonstrated by analysis of practices	600 0 0
	£2,055 10 0

It was indicated that the number of insured persons who could reasonably be cared for, working full time (48 hours a week), would be 2,236 persons. These must provide £2,055 10s.

£2,055 10s. ÷ 2,236 = 18·38s.

There are a number of extra services in the scope imposed on the insurance practitioner which the family physician in Australia is not required to do, as follows:

1. Keeping of records according to method described.
2. Certification: on, progressive and off.
3. Extra visits on account of necessity for certification. (Certification does not apply to dependants of lodge members.)
4. Arranging surgery hours to suit the National Insurance Commission. It raises obligations, difficult perhaps to fulfil, in peak periods.
5. Notifying the Commission regarding: (*a*) being away from home, (*b*) name of relieving officer, (*c*) carrying on practice at a branch surgery.
6. Arranging for inspection of records by regional officers.
7. Referring patients to regional officers with complete history. This responsibility is increasing in England.
8. Furnishing prescriptions for the purpose of the scheme of testing drugs and appliances.

There are additional services outside the scope which the physician must perform in the interests of the patient; for instance, visiting surgical patients operated on by specialists in hospital, not public hospitals; consultations over the telephone, a much more ample service in Australia than any other country in the world; ringing up public hospitals to arrange admission for patients requiring hospital nursing care (it may take as long as one or two hours on the telephone ringing up all the hospitals twice in one day or on successive days before arrangements can be made); making arrangements for surgical operations, coordinating times of consultant, hospital and anæsthetist. None of these, nor many other contingencies, have been included in the figure 3·5.

The age of the population is increasing; 500,000 people over forty years of age are now being admitted to the scheme. The age incidence and sickness incidence will steadily increase.

The extra amount due to be added in regard to these extra services within the scope is difficult to assess; but a reasonable amount would be 1·62s., raising the capitation fee to 20s.

REFERENCE VI.

The memorandum relating to reference VI of the terms of reference discussed:

1. The field of population to which the voluntary scheme may apply, having regard to: (*a*) numbers, (*b*) a comparison of those families which belong to friendly societies with those which do not, (*c*) loading or weighting for dependants, (*d*) adverse selection by poor risks.
2. Contributions to a scheme.
3. Administration.
4. Finance.
5. Benefits.

The twelve appendices were explained before presenting the memorandum.

Reference VI refers to the amount which should be paid under contract to medical practitioners by organizations which may provide on a voluntary basis for the treatment of the wives and children of insured persons, having regard to the terms of existing contract practice in Australia and the amount recommended under paragraph I.

Extract of Appendices.

Appendix I.

Extract from "Census Bulletin", Part 25, page 1698, shows that 85% (1,850,000) of employed people who will compulsorily enter insurance are classified as follows: employed females, 24%; single males, 36%; married males, 40% (14% without and 26% with children); and there are 58 children for every hundred insured: that is to say, 26% of the employed persons support children.

Appendix II.

Extract from "Commonwealth Year Book", 1937, page 340:

> Analysis of dependent children under sixteen years, according to families in the Commonwealth—Census 1933. 5·7% of the 1,919,859 children were supported by females; 94·3% were supported by males. Families with 1 child, 38%; 2 children, 29%; 3 children, 16%; 4 children, 9%; 5 children, 4%; more than 5 children, 4%. 33% of the families (less than 10% of the breadwinners) supported 58% of the children.

Appendix III.

Comparison of number of children in the Australian population and in friendly society families (Census Population, page 1133) and lodge sample, 11,332 members (Victorian Branch, British Medical Association).

Married: In population, 43% and in lodges 38% have no children; one child, 21·5% and 27·8%; two children, 16·40% and 20·6%; three children, 9·6% and 8·1%; four children, 4·8% and 3·0%; five children, 2·44% and 1·10%; six children, 1·21% and 0·6%; more than six children, 0·8% and 0·4%.

The families of friendly societies are smaller than the average population.

Appendix IV.

Comparison of number of children in families in (*a*) population, (*b*) lodges, (*c*) attending Children's Hospital, Melbourne, shows very decisively that large families are fewer in friendly societies than in the population, and that large families gravitate to the Children's Hospital.

Australian census, 1933, shows that 33% of families have three or more children (58% of the children).

The lodge census shows that 22% of the families have three or more children (40% of the lodge children).

The Children's Hospital statistics show that 56% of the families have three or more children (78% of the children).

Appendix V.

Analysis of sample of 11,332 lodge members (Victorian Branch, British Medical Association) shows that 70% have either dependent wives or children or both.

Appendix VI.

Analysis of 2,883 families (9,557 children in the families), one child from each of which attended the Children's Hospital, Melbourne (consecutive sequence), shows that 46% of the families and 54% of the children are below subsistence level.

The cost of the necessary food for a family in Melbourne in July, 1938, was ascertained by the dietitian of the Childrens' Hospital, Melbourne. Where the income of the family was less than this amount after rent had been arranged for, as indicated in the hospital register, the family was regarded as living below subsistence level.

In 1936-1937, 19,094 children attended the Children's Hospital.

Appendix VII.

This appendix shows that 29·5% of Australian children and 39·5% of Children's Hospital patients are under five years; 34% and 32% are under ten years. This indicates greater sickness in the lower age groups.

Appendix VIII.

Appendix VIII is an analysis of lodge and private practice: members, men, women and children in 1936-1937. It shows that the demands of the lodge member for medical care are the same as the combined average of wife and children.

Appendix IX.

Appendix IX is concerned with an extract from a report of the Essex County Medical Economic Research, Windsor, Ontario, showing an analysis of service to 21,870 persons for one month, December, 1936. The table gives a cross-section of medical care according to age. It seems to indicate that: (i) 80% of the service rendered is physician service; (ii) the number of services rendered to children, males of all ages over fifteen years, and females of all ages over fifteen years, is in the proportion of 10 for children, 17 for males, and 23 for females. Children and females together average the same as the males.

Appendix X.

Appendix X, from the "Eighteenth Annual Report of the Ministry of Health", England, shows that the approved societies apply most of the funds available for additional benefit to the purchase of false teeth and spectacles for older people. The development of the medical and hospital benefits is largely neglected.

Appendix XI.

Appendix XI is concerned with loading of friendly society and insured persons for dependants, having regard to the terms of existing contract practice in Australia.

Assume ten lodge members (three single and seven married) each pays 25s. *per annum* for medical benefit, and each represents 2·5 persons (1·0 member and 1·5 dependants). The annual payment is 250s. for 25 people.

Before insurance:	
3 single members at 25s.	75s.
7 married members at 25s., and 15 dependants	175s.
	250s.
After insurance:	
3 single members at 10s.	30s.
7 married members at 10s.	70s.
Also paying (25 – 10) × 7 for 15 dependants	105s.
	205s.

In the changeover the three single men have ceased to contribute 15s. each towards care for dependants. This can be rectified by: (i) reverting to the original situation, loading all men 15s.; that is, 10 men at (10s. + 15s.) = 250s.; or (ii) allowing each of the seven married men to pay for his wife, and load the whole ten men to pay for the eight children.

3 single men each pays (10s.) for himself) ..	30s.
7 married men each pays 10s. (for himself) and voluntarily pays 10s. for his wife = 20s.	140s.
8 children cost (8 × 10s.) = 80s. and are paid for by 10 men at 8s. each	80s.
	250s.

So that each single and married man is compulsorily loaded 8s. to pay for the children.

By reference to Census, Part 28, 1920, and Census, Part 25, 1698, it is deduced that the employed and dependants are arranged as follows: 60 single (24 female, 36 male), 40 married (40 dependent wives, 58 children). There is

an error of about 3% in this, due to absence of information in the census relating to adult dependants other than married women.

To employ the lodge principle of weighting or loading to cover all children of employed persons, the capitation rate would need to be loaded 60%. This arrangement will protect the scheme from exploitation by large families. To carry wives also it would need to be loaded or weighted 100%, having complete regard to the terms of existing contract practice in Australia. Unassisted by weighting of the single man going into insurance the married man with children on the average could only effect voluntary insurance for his dependent family by paying 3·6 times the capitation rate for all insured persons going into national health insurance. Forty-three *per centum* of the married have no children. The children are supported by 57% of the married persons, which is about 23% of the employed persons.

Appendix XII.

The principles governing the conduct of the voluntary part of the National Deposit Friendly Society in England should be applied to the management of poor risks. It is as follows: The contributor pays to the society a monthly sum of money (say 2s.). This is divided into two parts. Part *A* is paid to the fund; Part *B* is paid to the credit of a savings bank account in the name of the depositor with the society. Part *A* is allotted into separate funds for separate benefits: medical, sickness, funeral and administration. If any particular benefit is not desired by the contributor, then the money set aside for the development of that benefit is paid to the credit of the depositor in his savings bank account. In the present instance (reference VI) the benefits would be medical and pharmaceutical, and an allotment for administration. Contracts are arranged with a panel of medical practitioners for the treatment of patients seeking their assistance at an amount per attendance or visit agreed upon. The patient pays for service rendered, receives a receipt and presents it to the society for reimbursement. The extent to which the patient is reimbursed depends upon whether he is class *A*, *B* or *C* risk. This classification is determined when he joins the scheme. Class *A* comprises males aged five to thirty years; class *B* comprises males aged thirty to forty years, and females aged five to thirty years; class *C* comprises males aged forty to forty-five years, and females aged thirty to forty years. Class *A* receives 9d. in the 1s. of the fees paid, and pays the balance from the savings bank account. Class *B* receives 8d. in the 1s. and pays the balance from the savings bank account. Class *C* receives 6d. in the 1s. and pays the balance from the savings bank account. (Higher rates of contribution could be arranged to cover still worse risks.)

The incidence of sickness in the National Deposit Friendly Society was about half that of friendly society experience. (See *The British Medical Journal* Supplement, January 19, 1924, page 64.)

Memorandum: A compulsory insurance scheme against sickness presents a risk to be covered by insurance which is a fair average sickness risk for a community. A voluntary insurance scheme is liable to adverse selection (exploitation) by poor risks—large families, the aged or chronically sick—and protection against such a contingency is necessary. Large families, the aged, and chronically sick are those most requiring insurance against sickness risk. Restrictions against their exploiting the scheme are a matter for special provisions in the constitution of the scheme.

When no provision is made for either of these classes, if poor, then they suffer, or they may have to be cared for gratuitously, and such assistance as is necessary should be the responsibility of the community as a whole.

Voluntary Insurance Scheme for Dependants of Insured Persons.

Preliminary Explanation.

1. It is estimated that 1,850,000 out of 2,150,000 employed persons, or 85%, will come under the provisions of the compulsory *National Health and Pensions Insurance Act*. Of these, 400,000 are insured persons, at present members of friendly societies. Two hundred thousand friendly society members will not come under the compulsory *National Health and Pensions Insurance Act*.

When 400,000 employed persons leave friendly societies and are provided for under national insurance, the existing contract arrangements between the medical profession and friendly societies will be disturbed. The Royal Commission on doctors' remuneration is required, under number VI of its terms of reference, to indicate the amount which should be paid under contract to medical practitioners by organizations who may provide on a voluntary basis for the treatment of wives and children of insured persons, having regard to the terms of existing contract practice in Australia and the amount recommended under paragraph I.

2. The dependants, wives and children of insured persons are comprised as follows:

	Wives.	Children.	
(i) Dependants of friendly society members who will become insured persons	280,000	320,000	(Appendix V)
(ii) Dependants of 1,450,000 other insured persons ..	430,000	761,000	
	710,000	1,081,000	(Appendix 1)

3. The existing contracts of doctors with friendly societies are concessional arrangements dependent on supporting private practice. With expansion of contract practice and disappearance of private practice, existing concessional arrangements will have to be reviewed.

4. Members join friendly societies before or shortly after marriage, and their children, born after the members have joined the society, are a fair average sample of Australian children, excepting that members of friendly societies have (*a*) smaller families (Appendices II and III), and (*b*) more stable employment, so that they enjoy better economic conditions and better health than the average children. Wives are in the main good risks when they marry; if not, they are excluded from medical benefits.

5. The families which at present do not belong to friendly societies are more heavily weighted with children and rely to a greater extent upon the public hospitals. A comparison of the population as a whole, according to the Census of 1933, page 1133, friendly societies (Lodge Sample, British Medical Association, 1938), Children's Hospital families (Children's Hospital Sample, British Medical Association, 1938, Schedules VI and VII), is set out below.

(i) *Population as a Whole.*—Sixty-seven *per centum* of the families are of less than three children and contain 42% of the children; 33% of the families have three children or more and contain 58% of the children (Appendix II).

(ii) *Friendly Society Families.*—Seventy-eight *per centum* of the families are of less than three children and contain 58% of the children; 22% of the families are of three or more children and contain 42% of the children (Appendix IV).

(iii) *Children's Hospital Families.*—Forty-four *per centum* of the families have less than three children and contain 22% of the children; 56% of the families have three or more children and contain 78% of the children. (Note: 54% of these children are below subsistence level—Appendix VI.)

This shows very decisively that large families gravitate to the public hospitals, and friendly society families are smaller than those of the average population.

Those belonging to the Children's Hospital group (large families) have little hope of arranging medical care for themselves by voluntary insurance, except where very substantial assistance is given. Particular attention is drawn to the fact that 58% of the children of the community belong to families of three or more (Appendix II).

6. If a person voluntarily enters a friendly society, by a flat rate payment for single and married, a share is undertaken in the provision for dependants, whether the insured is married or single. This fulfils two requirements: (i) The young single member with small responsibility helps the older member with greater responsibility, that the single member in his turn may likewise be helped. (ii) The existence of children, since the introduction of the basic wage, has raised the wages of the single man and maintained them at a high level, and the children have never received the full share of the national dividend that was intended for them. The single men are drawing some of the wages intended for the children.

If the single wage-earners go into insurance and leave married friendly society members with full responsibility for dependants, then adherence to the above principles will be revoked. The capitation fee necessary to insure wives and children will be so high that voluntary insurance of dependants becomes impracticable. (For loading or weighting see Appendix X.)

7. Voluntary insurance under friendly societies is available only to good insurance risks. A member and, if married, his wife, are medically examined before admission to a lodge which entitles them to medical benefit. After national insurance commences and a voluntary scheme is initiated: (i) dependent wives who are good risks and childless may discontinue membership (Appendix III); (ii) those who, during the course of years, have become aged persons or poor risks from ill-health, may continue membership; (iii) dependants who previously did not belong to friendly societies and who are aged or ill, may elect to join the voluntary scheme; (iv) other dependants who are well and fit may not elect to join the voluntary scheme; (v) if a family unit system is initiated, the large families may join the scheme and the small families may not do so.

Unless special provision is made for the above contingencies, the scheme may be committed to provide for a large percentage of ill and aged people (poor risks) and large families.

Persons Who May Voluntarily Insure.

	Wives.	Children.
Dependants of friendly society members entering compulsory insurance	280,000	320,000
Dependants of 1,450,000 other insured persons	430,000	761,000
	710,000	1,081,000

The above will include the following:

Good risks. (*A*) Wives: (*a*) no children.
(*B*) Wives: (*b*) 1 or 2 children.
(*C*) Wives: (*c*) 3 or more children.
(*D*) Wives: (*d*) no children.
Poor risks. (*D*) Wives: (*d*) no children.
(*E*) Wives: (*e*) 1 or 2 children.
(*F*) Wives: (*f*) 3 or more children.

Contributions.

In accordance with term of reference VI and paragraph 6 in the preamble hereto, it is suggested as follows:

1. Every insured person or an authority on his or her behalf will compulsorily pay into the national insurance fund an additional sum of money per week, equal to 60% of the capitation rate agreed upon under reference I. The funds so created will be termed the "Voluntary Insurance Pool (Part *A*)", to be administered as hereinafter defined.

2. Voluntary insurance for wives of insured persons may be arranged by the insured person's voluntarily authorising his employer to pay to the national insurance funds weekly on his behalf the sum of 6d. (or other agreed amount), such sum to be deducted from his wages. The funds so created will be termed the "Voluntary Insurance Pool (Part *B*)", to be administered as hereinafter defined.

Administration.

1. The Government shall authorize the Minister of Health to set up in each State or Territory a board comprising:

(i) Medical chairman, appointed by the health department.

(ii) Medical member, appointed by the Health Department, from a panel of practitioners nominated by the practising profession.

(iii) A lay member agreed to by the Treasury and appointed by the Health Department from a panel of persons nominated by the approved societies. (Actuary to friendly societies has been suggested.)

2. The board shall be paid out of consolidated revenue.

3. Each insured person having dependent children under sixteen years will be invited to register such children with the board for reception of medical care and supplies, through a friendly society or other organization.

4. Where the insured person does not desire the provision of medical benefit and supplies through the agency of a friendly society or other organization, the board may itself provide the medical benefit for children.

5. Dependent wives will register for medical benefit with the board and present a classifying certificate according to whether the applicant is: *A*, a good insurance risk; *B*, a middling insurance risk; *C*, a poor insurance risk.

6. When a voluntary subscriber ceases to continue in insurance and remains out of insurance for a period of more than three months, such subscriber will not be readmitted to voluntary insurance without a qualifying medical certificate, for which a prescribed fee will be paid.

7. The board in each territory shall arrange by the use of funds at its disposal through friendly societies, trade unions and other organizations, or directly, for the provision of medical benefit for dependent children of insured persons. The board shall make agreements with medical practitioners and, when necessary, with pharmacists, for the provision of medical care and supplies to dependent children of insured persons registering (*a*) with other organizations and (*b*) with the board. The agreements shall define the scope of service.

8. Voluntary subscriptions shall be paid for an initial waiting period of three months, in order that reserves may be built up on behalf of the insured dependent wife before medical benefit becomes available.

(Note: Some endeavour will be made to arrange free insurance periods for dependent wives whose husbands are out of employment; this could be arranged by subscriptions from surplus funds of approved societies to the board.)

Finance.

1. The Voluntary Insurance Pool, Parts *A* and *B* (contributions) will be placed at the disposal of the board in each State or Territory in the following manner: Part *A*, in proportion to the number of compulsorily insured persons within each State or Territory; Part *B*, in proportion to the number of voluntary contributors within each State or Territory.

2. Part *A* of the funds so provided shall be reserved by each board for the purpose of providing medical benefits for all children of insured persons. The doctors entering into agreement with the board shall be eligible for appointment by friendly societies and other organizations, including the board, to attend upon children registered by friendly societies with the board. The doctor shall receive from the board an agreed upon capitation fee for each child upon his medical list.

The voluntary contributions of insured persons (Part *B*) on behalf of their dependent wives shall be administered by the board according to the principles of the National Deposit Friendly Society (Appendix XII).

Class *A* dependants will require to build up reserves against the contingency of development of poor risks among them. Class *B*, middling risks, and class *C*, poor risks, will require to make contributions greater than 6d., a system of loading to enable the extra risk to be covered while sharing in the general system of pooling.

A contingencies fund may be established by a small portion of the contribution set aside into reserve. This fund could provide loans against a premature heavy incidence of sickness.

Benefits.

1. The medical benefits include medical care, drugs and supplies, according to the prescribed scope, for: (*a*) dependent children of insured persons, (*b*) dependent wives who have been registered for the reception of medical benefit with the board.

2. Additional medical benefit may from time to time be prescribed by the board from surplus funds. The scope of service shall include examinations and treatment (including prescribing). Examinations may include all procedures followed in the examination of a life insurance proponent. Therapy shall also include injection of sedatives, and stimulants arresting hæmorrhage, incisions (without infiltration and general anæsthesia).

Correspondence.

CHAOUL THERAPY: A SPECIALIZED FORM OF X RAY TREATMENT.

SIR: With your permission I should like to reply to some of the questions raised by Dr. W. Keith Myers regarding my article on Chaoul therapy in his letter of the third instant.

I regret that I did not deal specifically with the superficial X ray methods in common use. My purpose in contrasting the factors of deep X ray therapy with those of the Chaoul method was to emphasize the salient features of the new technique and to dispel the widespread idea that it was suited to the treatment of cancer generally. The article then seemed long enough without dragging in any fresh issues.

However, since Dr. Myers has raised the point, I would like to state very definitely that I do not consider any one wave-length or voltage superior to any other, nor do I assert that the radiation from the Chaoul machine has any inherent superiority over radiation produced from any other machine. The difference is simply one of method, no new principles being applied. After all, the Chaoul instrument merely produces X rays which have no special magic properties.

The advantages of the Chaoul method as I see it are: (i) Flexibility and speed, with the ability to place the radiation in awkward places and in body cavities and orifices. This last point is naturally not of interest to the dermatologist, though it is of considerable significance to the professed radiotherapist, who has to take patients as they come. (ii) The greater margin of safety due to the spreading of the dose over a period of time, and more especially to the smaller depth dose. These are not of great importance with small localized lesions such as Dr. Myers mentions, for such lesions can be safely blasted out in one dose by any X ray method at all. In the case of a widespread lesion, however, needing heavy dosage for cure, these properties are likely to be of the utmost importance. By heavy dosage I mean 6,000 *r* and upwards, and by a widespread lesion I mean anything from two to six inches in diameter. Even with such lesions treated by the Chaoul instrument dosage can go ahead to the absolute limit with the assurance that permanent damage will be most unlikely.

The spreading of the dose can, of course, be consummated with any instrument at any voltage, but personally I have never been bold enough to give such large doses prior to using the Chaoul apparatus. For five years up to last year I carried out all my superficial therapy with a Coolidge tube operating at 140 kilovolts peak, 21 centimetres distance, with one millimetre of aluminium as filter, and I agree with Dr. Myers that excellent results are to be obtained with such methods. I will even concede that with localized lesions treated with discretion such methods give results equal to any method, but I cannot admit an equal degree of safety in treating wider lesions with such dosage, or, putting it another way, I do not think such large doses can be safely given to large areas with the older methods.

As the dermatologist's work mainly consists of large doses to very small neoplasms, or of very small doses to very wide areas, the Chaoul instrument is scarcely suited to his purpose as a sole instrument, though it can be very useful in special instances.

I am therefore far from thinking that the Chaoul apparatus supersedes the usual superficial therapy apparatus at 100 to 140 kilovolts peak. Personally I still find use for my Coolidge tube in lesions which seem too deep for the Chaoul. The truth is as I indicated, that each variety of radiation has its specific uses and that these are mainly governed by the geometry of the lesion to be treated, increasing the voltage and distance in accordance with the thickness of tissue to be penetrated.

Lastly, I would like to point out that single massive treatments can be given by the Chaoul instrument if required, just as with any other machine, though I have not so far found patients object to the multiple visits.

I would like to thank Dr. Myers for his interest and constructive discussion of my article.

Yours, etc.,

ERIC W. FRECKER.

British Medical Association House,
137, Macquarie Street,
Sydney.
January 17, 1939.

LOCAL ANÆSTHESIA FOR RETROSTERNAL GOITRE.

SIR: I quite agree with Dr. Corlette's idea that the pain, which made me desist from shelling out the intrathoracic portion of the thyreoid, was caused mainly by stimulation of blood vessels; quite soon after starting to use local analgesia it was forcibly borne in on one that it is hard to anæsthetize the larger arteries with local infiltration, and in my experience it is still harder with nerve blocking.

In addition to the traction on the inferior thyreoid arteries, there was another factor causing pain, namely, the presence of the arch of the aorta and the left common carotid artery in the left wall of the mediastinal cavity. In common with the other mediastinal tissues, neither of these vessels had been anæsthetized, and they were very sensitive; and though by no means timid, I was satisfied that it would need a better man than I was to infiltrate their surroundings with the thoracic inlet still occupied by the goitre. Anybody who has read Braun's book on local anæsthesia with a seeing eye must realize what a bold and courageous man he is; but nevertheless, on page 285 of the second American edition of his book, he limits the scope of local analgesia in chest operations to the chest wall and to the transpleural approach to the diaphragm, so I feel that in retreating I was in good company.

I doubt if blocking the brachial plexus and two or three intercostal nerves, as Dr. Corlette suggests, would have anæsthetized these vessels, because of their very rich autonomic supply; but the suggestion will be well worth remembering, in case a suitable chance comes to try it.

The difficulty of shelling out intrathoracic goitres seems overrated by the uninitiated, but their delivery is usually easy, because their blood supply comes from above through the inferior thyreoid arteries, and there are no vascular connexions with the mediastinal tissues. In addition, these tissues are pushed aside by the goitre as it grows down, and so form an ideal plane of cleavage, so that if the intrathoracic mass is not too large or bulbous it often almost pops out. This one was both large and bulbous, and did not strip as easily as usual, perhaps because of inflammatory reaction to the hæmorrhage; the result was more handling and pain, and thus in turn the necessity for a general anæsthetic.

My main reason for reporting this case was to emphasize the safety and efficiency of local analgesia in selected cases and to plead for its more general use in everyday surgery, for in my experience it has yielded the happiest results.

Yours, etc.,

MAYNARD FURBER.

143, Macquarie Street,
Sydney,
January 17, 1939.

The Royal Australasian College of Physicians.

EXAMINATION FOR MEMBERSHIP.

THE written examination for the membership of the Royal Australasian College of Physicians will be held in Melbourne on March 21 and 22, 1939. Intending applicants are reminded that application forms should be in the hands of the Honorary Secretary, 185, Macquarie Street, Sydney, not later than January 28, 1939.

Books Received.

INDIVIDUAL PSYCHOLOGY MEDICAL PAMPHLETS, NUMBER 20: A PHILOSOPHER LOOKS AT PSYCHOTHERAPY, PSYCHOLOGICAL FACTORS IN ORGANIC DISEASE, PSYCHIATRY AND THE COMMUNITY, THE FAMILY, SOCIETY AND EDUCATION, by J. Macmurray, A. T. M. Wilson, R. Noble and F. G. Crookshank; 1938. London: The C. W. Daniel Company Limited. Demy 8vo, pp. 70. Price: 2s. 6d. net.

Diary for the Month.

FEB. 1.—Victorian Branch, B.M.A.: Branch.
FEB. 1.—Western Australian Branch: Council.
FEB. 2.—South Australian Branch, B.M.A.: Council.
FEB. 3.—Queensland Branch, B.M.A.: Branch.
FEB. 7.—New South Wales Branch, B.M.A.: Organization and Science Committee.
FEB. 10.—Queensland Branch, B.M.A.: Council.
FEB. 14.—New South Wales Branch, B.M.A.: Executive and Finance Committee.
FEB. 21.—New South Wales Branch, B.M.A.: Ethics Committee.
FEB. 22.—Victorian Branch, B.M.A.: Council.
FEB. 23.—South Australian Branch, B.M.A.: Branch.
FEB. 24.—Queensland Branch, B.M.A.: Council.
FEB. 28.—New South Wales Branch, B.M.A.: Medical Politics Committee.

Medical Appointments.

Dr. H. K. Denham has been appointed Government Medical Officer at Southport, Queensland.

* * *

Dr. G. H. Howard has been appointed Deputy Superintendent of the Northfield Mental Hospital at Adelaide, South Australia.

* * *

Dr. T. C. Kohler has been appointed Quarantine Officer at Wallaroo, South Australia, in accordance with the provisions of the *Quarantine Act* of 1908-1924.

Medical Appointments Vacant, etc.

For announcements of medical appointments vacant, assistants, *locum tenentes* sought, etc., see "Advertiser", pages xvi, xvii, xviii.

BALONNE HOSPITAL BOARD, ST. GEORGE, QUEENSLAND: Medical Officer.

DEPARTMENT OF PUBLIC HEALTH, PERTH, WESTERN AUSTRALIA: Medical Officer.

SAINT VINCENT'S HOSPITAL, SYDNEY, NEW SOUTH WALES: Honorary Officers.

THE PRINCE HENRY HOSPITAL, SYDNEY, NEW SOUTH WALES: Fellow in Anæsthesia.

THE RACHEL FORSTER HOSPITAL FOR WOMEN AND CHILDREN, SYDNEY, NEW SOUTH WALES: Resident Medical Superintendent.

Medical Appointments: Important Notice.

MEDICAL PRACTITIONERS are requested not to apply for any appointment referred to in the following table without having first communicated with the Honorary Secretary of the Branch named in the first column, or with the Medical Secretary of the British Medical Association, Tavistock Square, London, W.C.1.

BRANCHES.	APPOINTMENTS.
NEW SOUTH WALES: Honorary Secretary, 135, Macquarie Street, Sydney.	Australian Natives' Association. Ashfield and District United Friendly Societies' Dispensary. Balmain United Friendly Societies' Dispensary. Leichhardt and Petersham United Friendly Societies' Dispensary. Manchester Unity Medical and Dispensing Institute, Oxford Street, Sydney. North Sydney Friendly Societies' Dispensary Limited. People's Prudential Assurance Company Limited. Phœnix Mutual Provident Society.
VICTORIAN: Honorary Secretary, Medical Society Hall, East Melbourne.	All Institutes or Medical Dispensaries. Australian Prudential Association, Proprietary, Limited. Mutual National Provident Club. National Provident Association. Hospital or other appointments outside Victoria.
QUEENSLAND: Honorary Secretary, B.M.A. House, 225, Wickham Terrace, Brisbane, B.17.	Brisbane Associate Friendly Societies' Medical Institute. Proserpine District Hospital. Members accepting LODGE appointments and those desiring to accept appointments to any COUNTRY HOSPITAL are advised, in their own interests, to submit a copy of their Agreement to the Council before signing.
SOUTH AUSTRALIAN: Secretary, 178, North Terrace, Adelaide.	All Lodge appointments in South Australia. All Contract Practice Appointments in South Australia.
WESTERN AUSTRALIAN: Honorary Secretary, 205, Saint George's Terrace, Perth.	All Contract Practice Appointments in Western Australia.

Editorial Notices.

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